

EU R&D SURVEY

The 2015 EU Survey
on Industrial R&D
Investment Trends

European Commission

Joint Research Centre
Institute for Prospective Technological Studies (IPTS)

Contact information

European Commission
Joint Research Centre
Institute for Prospective Technological Studies
Edificio Expo
C/ Inca Garcilaso 3
E-41092 Seville (Spain)
Tel.: +34 95 448 83 18, Fax: +34 95 448 83 00
e-mail: jrc-ipts-secretariat@ec.europa.eu
<https://ec.europa.eu/jrc>

Acknowledgements

“The 2015 EU Survey on Industrial R&D Investment Trends” has been published within the context of the Industrial Research and Innovation Monitoring and Analysis (IRIMA) activities that are jointly carried out by the European Commission’s Joint Research Centre (JRC) – Institute for Prospective Technological Studies (IPTS) and the Directorate General for Research – Directorate A, Policy Development and Coordination.

IRIMA activities aim to improve the understanding of industrial R&D and Innovation in the EU and to identify medium and long-term policy implications.

The project was coordinated under the leadership of Alessandro Rainoldi (Head of JRC-IPTS Knowledge for Growth – KfG Unit) and Román Arjona Gracia (Head of DG RTD.A4 Analysis and monitoring of national research policies). This document was produced by Alexander Tübke, Fernando Hervás, Nicola Grassano and Petros Gkotsis (KfG Unit) as the main authors. Héctor Hernández, Sara Amoroso, Mafini Dosso, and Antonio Vezzani from the KfG Unit and Diana Ivanova van Beers from DG RTD.A made contributions to the design and review of the survey.

The JRC-IPTS and DG RTD-A would like to express their thanks to everyone who has contributed to this project.

Any comments can be sent by email to: JRC-IPTS-IRI@ec.europa.eu

More information, including activities and publications, is available at: <http://iri.jrc.ec.europa.eu/> and <http://ec.europa.eu/research/>

Legal Notice

This publication is a Science and Policy Report by the Joint Research Centre, the European Commission’s in-house science service. It aims to provide evidence-based scientific support to the European policy-making process. The scientific output expressed does not imply a policy position of the European Commission.

Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use which might be made of this publication.

All images © European Union 2015

JRC98214

EUR 27541 EN

ISBN 978-92-79-53027-2 (pdf), ISBN 978-92-79-53026-5 (print)

ISSN 1831-9424 (online), ISSN 1018-5593 (print)

doi:10.2791/536246 (online), doi:10.2791/692137 (print)

Luxembourg: Publications Office of the European Union, 2015

© European Union, 2015

Reproduction is authorised provided the source is acknowledged



EU R&D SURVEY

The 2015 EU Survey on Industrial R&D Investment Trends

Alexander Tübke, Fernando Hervás,
Nicola Grassano and Petros Gkotsis

2015

Contents

Summary	5
R&D investment expectations	5
Key Enabling Technologies (KETs)	6
Location of R&D investment	7
Country attractiveness for R&D	7
Structural reforms for R&D	8
1 Introduction	9
2 R&D Investment Expectations	13
3 Key Enabling Technologies (KETs)	17
Technological content of R&D by technology group	18
Number of patents	20
Revenues from licences issues and expenses for licences used	22
4 R&D Investment Location	25
5 Attractiveness of Countries for R&D	29
Countries considered the most attractive location for the company's R&D	29
Attractiveness of the two countries where the company has the greatest R&D activity	30
Attractiveness of EU countries	32
Attractiveness of EU countries versus the US	33
Attractiveness of EU countries versus China and India	34
6 Structural reforms for R&D	35
7 Annex A: Methodology	37
Background and Approach	37
Link to the R&D Investment Scoreboards	37
Methodology	38
R&D Investment Definition	39
Composition of the Responses	39
8 Annex B: Questionnaire	43

Summary

This report analyses the tenth survey on industrial Research & Development (R&D) investment trends. It is based on 162 responses of mainly large firms from a subsample of the 1000 EU-based companies in the 2014 EU Industrial R&D Investment Scoreboard.¹ These 162 companies are responsible for €60 billion R&D investment from their own resources, constituting around 36% of the total R&D investment by the 1000 EU Scoreboard companies. The main findings of the survey are as follows.

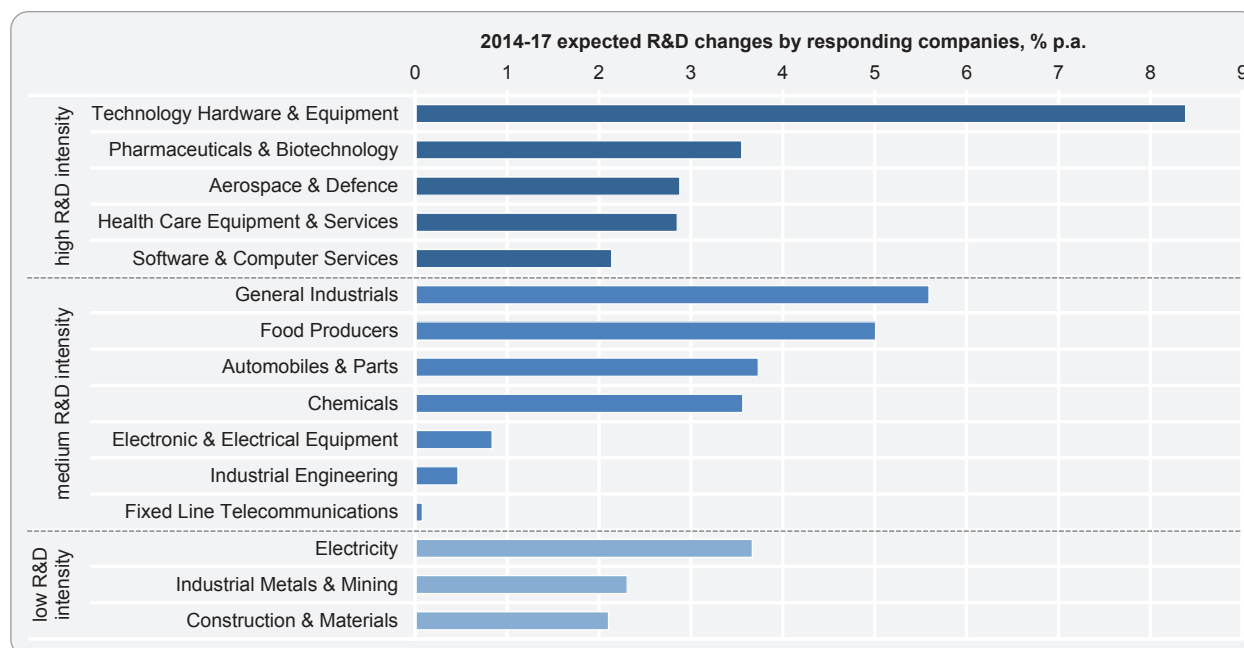
R&D investment expectations

The responding companies expect to increase their nominal R&D investment by 3.0% per year during 2015–17. This is a third less than the expected increases of last year's survey (4.2%) and slightly higher than the results of the one the year before (2.6%).

Only respondents from the technology hardware & equipment sector (8.4% per year over the next three years) reported higher R&D investment expectations than in our previous two surveys. Most respondents state expectations that are slightly stagnating or up to one-third lower than previously: general industrials (5.6%), food producers (5.0%), automobiles & parts (3.7%), electricity (3.7%), chemicals (3.6%), pharmaceuticals and biotechnology (3.6%), industrial metals & mining (2.3%) and industrial engineering (0.5%). In a number of sectors, expected R&D investment increases are even more than a third lower than previously: aerospace & defence (2.9%), health care & equipment (2.9%), software & computer services (2.1%), construction & materials (2.1%), electronic & electrical equipment (0.8%), and fixed line telecommunications (0.1%).

Responses concerning R&D expectations from the automobiles & parts sector constitute half of the R&D for which expectations were issued, so the sample average

Figure 1: Expected changes of R&D investment of the surveyed companies 2014-17, p.a.



Note: p.a. per annum. Note: The figure refers to 123 out of the 162 EU companies in the sample

Source: European Commission JRC-IPTS (2015)

¹ These are 633 EU-based companies of the world top 2 500 companies in the 2014 Scoreboard and 367 additional companies from the EU with an R&D investment of over € 5.0 million in the accounting period 2013/14.

expectations are thus marked by those from that sector. Compared to the negative expectations for this sector two years ago (-0,4% in the 2013 Survey), R&D investment expectations are back to a healthy growth level (3.7%).

Key Enabling Technologies (KETs)

Activities related to Key Enabling Technologies (KETs) are concentrated in environmental and social KETs.

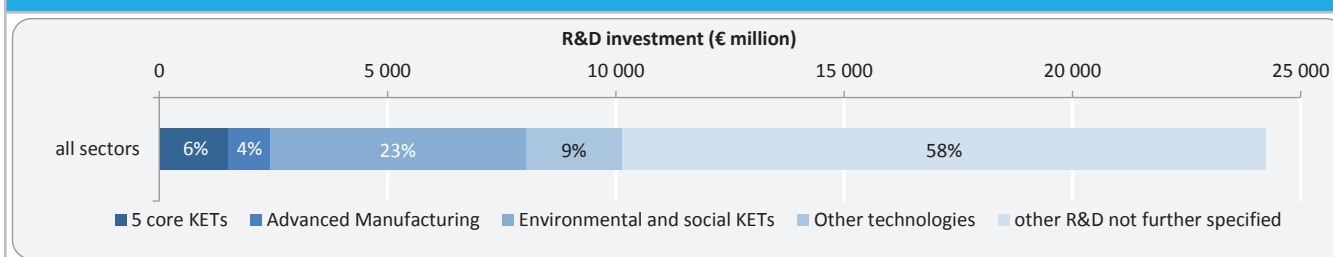
Slightly more than half of the respondents detailed their R&D by technological field, where environmental and social KETs alone represent 23% of the overall 2014 R&D investment. The 5 “core” KETs (advanced materials, industrial biotech, micro- & nanoelectronics, nanotechnology and photonics)

constitute 6% and Advanced Manufacturing technologies 4% of the respondents’ R&D. The KETS altogether represent one third of the R&D invested by the surveyed firms, whereas the remaining two thirds fall into other technologies relevant for the company (9%) and other R&D not further specified (58%).

Patents filed as reported by the respondent firms are fairly distributed among the different kind of technologies surveyed.

The relative majority (31%) of patents by technology is in the 5 “core” KETs (advanced materials, industrial biotech, micro- & nanoelectronics, nanotechnology and photonics), followed by environmental and social (25%) and Advanced Manufacturing technologies (30%).

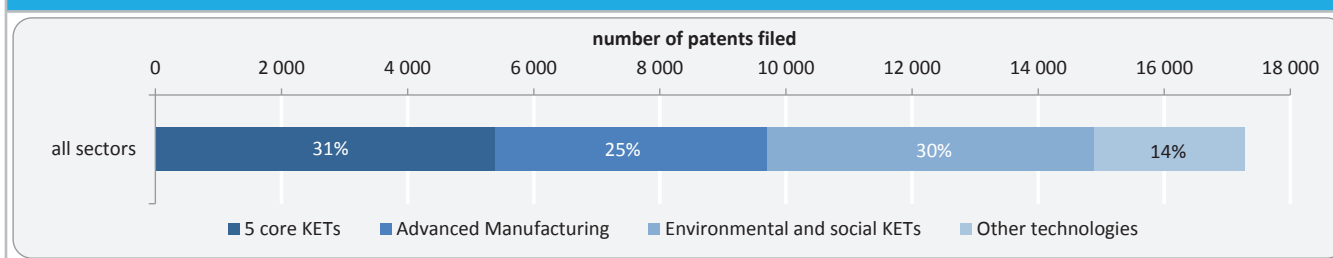
Figure 2: R&D investment in KETS and other relevant technologies



Note: The figure refers to 90 out of the 162 EU companies in the sample

Source: European Commission JRC-IPTS (2015)

Figure 3: Number of patents filed by technological group



Note: The figure refers to 98 out of the 162 EU companies in the sample

Source: European Commission JRC-IPTS (2015)

Location of R&D investment

The 149 companies which provided information make one-fourth of their R&D outside the EU.

The largest share of R&D investment outside the EU is in the United States and Canada (11%), followed by China (6%), the rest of the world (6%), India (2%), other European countries (1%) and Japan (1%).

The responding companies' expectations for R&D investment for the next three years show the ongoing participation of European companies in the global economy. While maintaining the focus of their R&D investment in the EU, they reap opportunities for growth in emerging economies.

Examining the distribution of the expected 3.0% R&D increases by world region, expectations for the EU are slightly lower than the average (2.6% per year over the next three years). Much higher growth is expected in the non-EU world regions: India (15.8%); China (6.9%); the United States and Canada (5.8%); and the rest of the world (3.8%). Expectations for Japan and other European countries have become slightly negative (-0.8% and -1.3%, respectively) and apply to rather small R&D investment amounts. All in all, the expected nominal R&D investment increases in the EU continue to be of a similar magnitude to those outside the EU (around € 736 million for a total of € 1212 million per year for the 125 companies which provided information).

Country attractiveness for R&D

Three out of four of the responding EU-based companies consider their home country among the three most attractive locations for R&D. Regarding non-EU countries, the United States, China and India are seen as the most attractive locations outside the home country.

Although many of the respondents are headquartered in Germany, France and the United Kingdom, there is no home-bias towards the three biggest EU Member States. The share of respondents favouring their home-country is higher than for the three biggest EU Member States in Italy, Finland, Denmark, Austria, Portugal, and Hungary.

Knowledge-sharing, proximity and R&D personnel in the labour market are the criteria that make countries attractive for R&D activity.

For the countries where companies have the greatest R&D activity, the criteria most influencing attractiveness were said to be knowledge-sharing and collaboration opportunities (with universities and public research organisations), proximity (to other company sites and technology poles & incubators) and R&D personnel in the labour market (quality, quantity and labour costs). Quality and quantity of R&D

personnel in the labour market clearly rank ahead of labour costs, which are seen as a neutral factor.

Intellectual property rights (IPR) (in terms of enforcement conditions, costs of protection and time to protection), and demand for innovation in terms of market size are perceived as neutral factors for attractiveness. Most aspects of public R&D support (public-private partnerships, loans & guarantees and financing other investments) as well as Innovation demand (via product market regulation, market growth and public procurement) were not seen as factors for attracting R&D.

In a separate comparison of attractiveness factors among R&D sites within the EU, quality of R&D personnel, knowledge-sharing opportunities with universities and public organisations and proximity to other company sites are by far the most frequently stated in the top three.

They are followed by proximity to technology poles & incubators (United Kingdom, Denmark and The Netherlands) and quantity of R&D personnel (Italy and Spain). Public support for R&D was among the three most relevant factors for Belgium and Austria (via grants and direct funding) and France (via fiscal incentives). The factors that are the least attractive centre on demand for innovation via market growth (France, Austria, Denmark, and the Netherlands), market size (Austria and Denmark) and public procurement (Belgium and Italy). Also public R&D support via financing other (non-R&D) investments (United Kingdom and Spain) and fiscal incentives (Germany and Sweden) could improve the attractiveness of countries.

Comparing R&D attractiveness factors within the EU with those for the United States for 33 actual cases, the respondents point to proximity factors, knowledge-sharing opportunities and quality and quantity of R&D personnel as the leading factors for both world regions.

As observed in previous years, the respondents consider the United States more attractive for R&D than the EU regarding market size and growth, whereas the quality of R&D personnel in the labour market stood out in EU countries.

Comparing R&D attractiveness factors within the EU with those for China and India, the 11 respondents reveal significant differences between the two world areas.

For R&D sites in the EU, proximity (to other company sites, technology poles and incubators, and suppliers), quality of R&D personnel, and knowledge-sharing opportunities (with universities and public organisations and other firms) are the most relevant factors.

For R&D sites in China and India, market size and growth, together with the quantity of R&D personnel, are the main

determinants of attractiveness. Different from previously, labour costs of R&D personnel receive a similar perception for both the EU and China and India. The latter also lack attractiveness in terms of quality of R&D personnel.

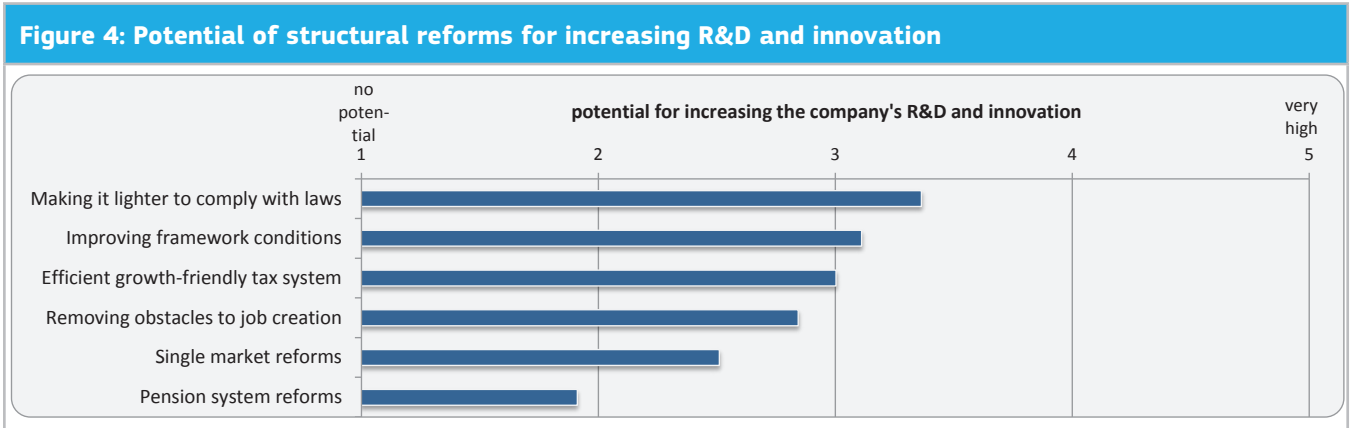
Structural reforms for R&D

Concerning EU initiatives for structural reforms to boost industrial R&D activity, the highest potential was deemed for making it lighter, simpler and less costly to comply with EU and national laws.

This is followed by improving framework conditions (for business investment and public-private partnerships), an efficient and growth-friendly tax system (via reducing complexity, prioritising growth-friendly public investment and shifting the tax burden away from labour tax to others) and removing obstacles to job creation (via increasing labour tax deductions, upgrading vocational training, modernising levels of protection for those in work, reforming labour dispute resolution and reducing labour market segmentation).

Single market reforms (for the free flow of services, goods, energy and online services and entertainment) and pension system reforms (closer linking retirement ages to life expectancy and reducing employer contributions to obligatory employee pensions schemes) were not perceived as having a substantial potential for increasing the company's R&D and innovation.

For companies in the high and medium R&D intensity sectors, removing obstacles to job creation (via increasing labour tax deductions, upgrading vocational training and modernising levels of protection for those in work) show a higher potential for increasing the company's R&D and innovation than for the low R&D intensity sectors. However, the potential of single market reforms allowing the free flow of energy (eliminating energy islands and integrating renewables) for the company's R&D and innovation is substantially higher for the medium and low R&D intensity sectors than for the high R&D intensity ones.



Note: The figure refers to 158 out of the 162 EU companies in the sample
Source: European Commission JRC-IPTS (2015)

1 Introduction

Investment in research and innovation is one of the EU's highest policy priorities. The "Investment Plan for Europe" and its European Strategic Investment Fund (ESIF)² have the objective to support long-term strategic investment projects in several areas including education, research and innovation. Improving the knowledge on the location of top R&D innovators' activities (including innovation, production and employment) is of particular relevance in the context of the assessment of Member States' (European Semester) and region's (smart Specialisation) industrial innovation policies.

R&D investment is one of the five main targets of Europe 2020, the EU's growth strategy for the current decade.³ This is implemented via seven 'flagship initiatives' through which the EU and national authorities can mutually reinforce their efforts in areas supporting Europe 2020. One of them is the Innovation Union flagship initiative,⁴ with a 3% EU headline target for intensity of research and development (R&D) investment.⁵ R&D investment from the private sector, however, plays a key role not only for the Innovation Union flagship initiative but also for other relevant Europe 2020 initiatives, such as the Industrial Policy,⁶ Digital Agenda and New Skills for New Jobs flagship initiatives.

The Industrial Research and Innovation Monitoring and Analysis (IRIMA) project⁷ supports policymakers in these initiatives and monitors progress towards the 3% headline target. IRIMA's core activity is the EU Industrial R&D Investment

Scoreboard,⁸ which analyses private R&D investments based on the audited annual accounts of companies and shows *ex-post* trends. By collecting expectations and qualitative statements from the EU Scoreboard companies, the present survey complements the Scoreboard with *ex-ante* information.

Ten surveys have been undertaken since 2005.⁹ Similar to its predecessor, the present survey addresses the R&D investment expectations for 2015-17, R&D location strategies and the role of certain key enabling technologies (KETs) in the development of new goods and services.¹⁰ A new question on structural reforms supporting R&D and innovation has been introduced in this year's questionnaire, linked to the Commission important reforms of the EU's economic governance rules.¹¹

In our surveys, 'R&D investment' is defined as the total amount of R&D financed by the company no matter where or by whom it was performed. This excludes R&D financed by governments or other companies, as well as the company's share of any associated company or joint venture R&D investment. It includes, however, research contracted out to other companies or public research organisations, such as universities. The survey reports what each responding company states as its actual financial commitment to R&D. This is different from the official statistical concept, business expenditure on R&D (BERD), which provides a geographical perspective.¹²

The questionnaire was sent by post to the top operational level (chief executive officer or similar) or previous year's contact person of the 1 000 European companies that appear in the 2014 EU Industrial R&D Investment Scoreboard. A total of 162 responses, equivalent to a response rate of

2 Proposal for a Regulation on the European Fund for Strategic Investments – COM(2015) 10 of 13.1.2015

3 European Commission, Europe 2020: a strategy for smart, sustainable and inclusive growth (see: http://ec.europa.eu/eu2020/index_en.htm).

4 The Innovation Union flagship initiative aims to strengthen knowledge and innovation as drivers of future growth by refocusing R&D and innovation policies for the main challenges society faces.

5 This target refers to the EU's overall (public and private) R&D investment approaching 3% of gross domestic product (see: http://ec.europa.eu/europe2020/pdf/targets_en.pdf).

6 The Industrial Policy for the Globalisation Era flagship initiative aims to improve the business environment, notably for small and medium-sized enterprises, and support the development of a strong and sustainable industrial foundation for global competition.

7 See: <http://iri.jrc.ec.europa.eu/home/>. The activity is undertaken jointly by the Directorate General for Research (DG RTD A; see: <http://ec.europa.eu/research/index.cfm?lg=en>) and the Joint Research Centre, Institute for Prospective Technological Studies (JRC-IPTS; see: <https://ec.europa.eu/jrc/en/science-area/innovation-and-growth>).

8 The Scoreboard is published annually and provides data and analysis on companies from the EU and abroad investing the largest sums in R&D (see: <http://iri.jrc.ec.europa.eu/scoreboard.html>).

9 See: <http://iri.jrc.ec.europa.eu/survey.html>

10 See section 3.

11 See: "The 2015 Annual Growth Survey": http://ec.europa.eu/europe2020/pdf/2015/ags2015_en.pdf

12 BERD includes R&D financed by the company itself, as well as R&D performed by a company but funded from other sources. Official BERD figures comprise R&D carried out by the companies physically located in a given country or region (including foreign-owned subsidiaries), regardless of the source of funding.

16.2%,¹³ were received. The response rate was slightly lower than in our previous survey (18,6%) due to a significantly shorter response period.

The 162 companies participating in the current exercise report a total global R&D investment of € 60 billion for the year 2014, or around 36% of the total R&D investment by the 1 000 EU Scoreboard companies. Table 1 shows the number of responses received by sector group and the share of R&D of the respondents compared to the 1 000 EU Scoreboard companies.¹⁴

Table 1: Number of responses, by sector group			
Sector Group	ICB Sector	Number of responses	R&D share of the sample of the 1000 EU Scoreboard companies
High R&D intensity	Pharmaceuticals & Biotechnology, Software & Computer Services, Aerospace & Defence, Technology Hardware & Equipment, Health Care Equipment & Services and Leisure Goods	52	23%
Medium R&D intensity	Industrial Engineering, Automobiles & Parts, Electronic & Electrical Equipment, Chemicals, General Industrials, Fixed Line Telecommunications, Food Producers, Household Goods & Home Construction, Support Services, Alternative Energy, Beverages, Financial Services, Oil Equipment, Services & Distribution, Personal Goods, Tobacco and Travel & Leisure	73	49%
Low R&D intensity	Industrial Metals & Mining, Electricity, Construction & Materials, Banks, Oil & Gas Producers, Forestry & Paper, Gas, Water & Multi-utilities and Industrial Transportation	37	24%
		162	36%

Source: European Commission JRC-IPTS (2015)

¹³ See Annex A: The Methodology of the 2015 Survey.

¹⁴ R&D intensity is the ratio between R&D investment and net sales. An individual company may invest a large overall amount in R&D but have a low R&D intensity if net sales are high (as is the case of many oil & gas producers, for example). For the sector groupings see: Annex A: The Methodology of the 2015 Survey.

Companies in the medium R&D intensity sectors constitute the majority of respondents in the sample. These sectors also constitute the majority of R&D investment of the sample in both the present survey and the 2014 Scoreboard (Figure 5 below). An emphasis on the sectors with medium R&D intensity in the survey sample was also observed last year, and this is even higher in the present exercise. This is due to an over-representation in terms of R&D from companies in the automobiles and parts sector in the sample.

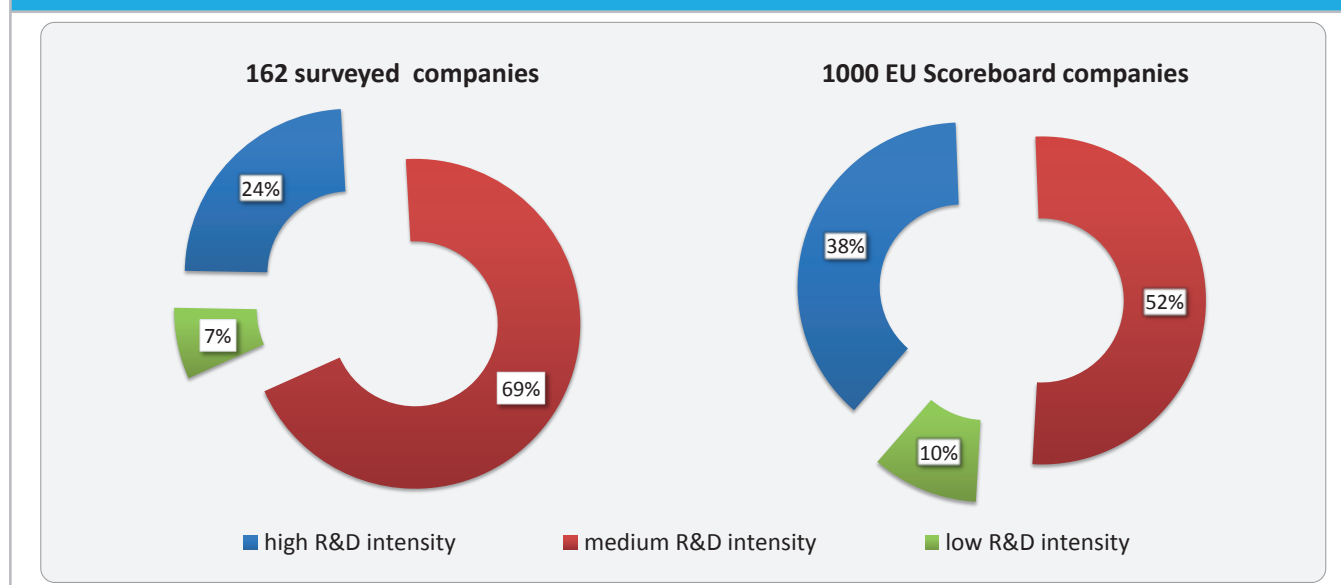
As in our previous surveys, the participating companies are very large, with an average turnover of € 13 billion, 33 000 employees in total and 2 125 employees engaged in R&D. In the sample, there are only seven medium-sized companies and one small company (mainly in the sectors with high R&D intensity). Among the large companies in the sample, 23 had between 251 and 1 000 employees, 71 between 1 001

and 10 000 employees, 42 between 10 001 and 30 000 employees, and 42 more than 30 000 employees.

It follows that the survey differs from the Community Innovation Survey (CIS), which uses a different sampling technique, taking in a much higher number of small and medium-sized firms.¹⁵

The response rate was lower than in the previous survey due to a significantly shorter response period. The response rate per day was the same as in the previous survey and the responsiveness of previous participants increased to 65%.¹⁶

Figure 5: Distribution of R&D investment in the survey compared to the 2014 Scoreboard



Note: The figure refers to all 162 companies in the sample.

Source: European Commission JRC-IPTS (2015)

¹⁵ The CIS uses stratified sampling for at least three size classes (small, medium and large enterprises) across all EU Member States.

¹⁶ Out of the 162 responding companies, 106 had participated in the previous two surveys (in 2014, 90 out of 186), 65 in the previous three, 50 in the previous four, 38 in the previous five, 27 in the previous six, 16 in the previous seven, 11 in the previous eight, 7 in the previous nine surveys and 4 in all ten surveys (incl. the 2005 pilot).

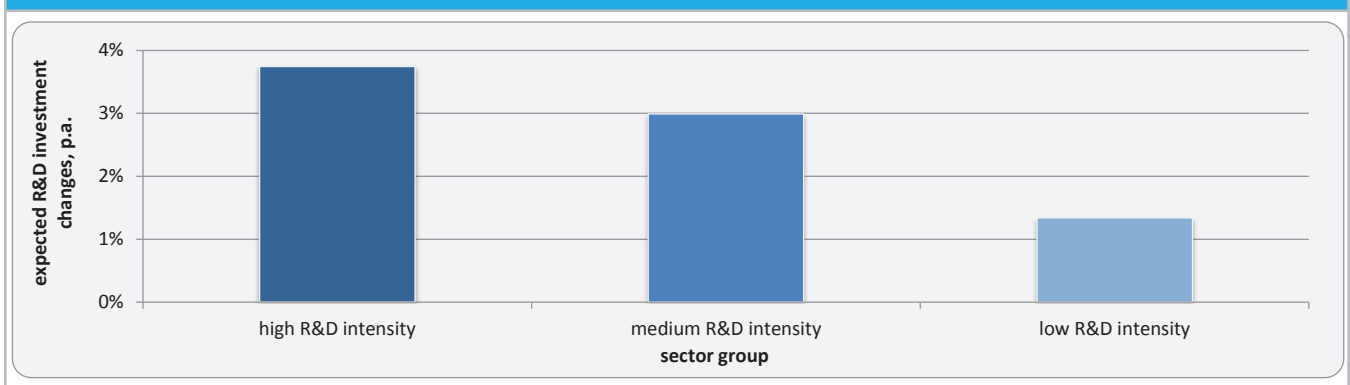
2 R&D Investment Expectations

The responding companies expect to increase their nominal R&D investment by 3.0% per year during 2015–17.¹⁷ This is a third less than the expected increases of last year's survey (4.2%) and only slightly higher than the results of the 2013 survey a year before (2.6%).

This 3.0% annual growth in corporate R&D investment is a positive outlook, above the nominal EU growth estimates for gross domestic product (GDP) of 1.8% for 2015 and 2.1% for

2016.¹⁸ However, R&D investment expectations are still far from the levels reported prior to the 2008 economic crisis (7% in the 2007 survey). Similar to our past surveys, the highest expectations come from companies in the high R&D intensity sectors (3.7%), followed by the medium (3.0%) and low R&D intensity (1.3%; see Figure 6 below) ones. The reduction by one-third in the overall expectations compared to the past year is found in all the three sector groups.

Figure 6: Expected nominal changes in R&D investment in the next three years, per annum



Note: The figure refers to 146 out of the 162 companies in the sample, weighted by R&D investment.

Source: European Commission JRC-IPTS (2015)

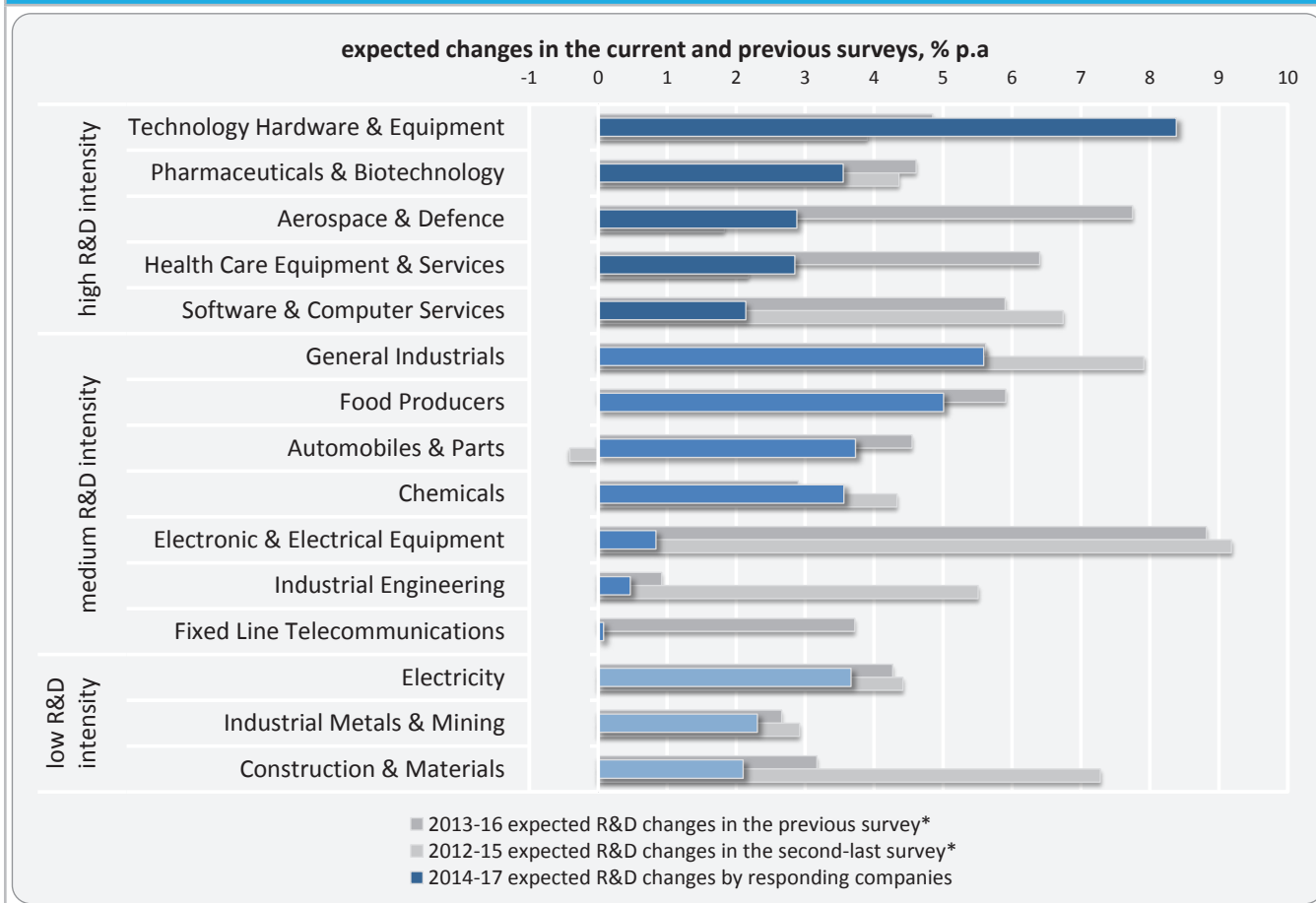
¹⁷ The expectations are per annum over the next three years, weighted by R&D investment.

¹⁸ European Commission, "Spring 2015 economic forecast" (see: http://ec.europa.eu/economy_finance/publications/european_economy/2015/pdf/ee2_en.pdf).

The next Figure 7 shows how the expected changes in R&D investment for the next three years (2014–17) compare to those of our two previous surveys (for 2013–16 and 2012–15, respectively).¹⁹ Compared to last year, expectations have slipped in 12 out of the 15 sectors with at least five responses.

The figure refers to 123 out of the 162 companies in the sample, weighted by R&D investment. Only for sectors with at least five responses.

Figure 7: Expected changes in R&D investment in the current and the two previous surveys, p.a.



Note: p.a. per annum

* The sample compositions in the surveys vary from year to year.

Growth rates calculated as CAGR over the three years for which expectations were mentioned (see Annex A: The Methodology of the 2015 Survey).

Source: European Commission JRC-IPTS (2015)

19 The samples in the different surveys have different compositions.

Only respondents from the technology hardware & equipment sector (8.4% per year over the next three years) reported higher R&D investment expectations than in our previous two surveys. Most respondents state expectations that are slightly stagnating or up to one-third lower than previously: general industrials (5.6%), food producers (5.0%), automobiles & parts (3.7%), electricity (3.7%), chemicals (3.6%), pharmaceuticals and biotechnology (3.6%), industrial metals & mining (2.3%) and industrial engineering (0.5%).

In a number of sectors, expected R&D investment increases are even more than a third lower than previously: aerospace & defence (2.9%), health care & equipment (2.9%), software & computer services (2.1%), construction & materials (2.1%), electronic & electrical equipment (0.8%), and fixed line telecommunications (0.1%). Many of these are in the group with high R&D intensity, and their expected reductions are offset by the expected increases of the technology hardware & equipment sector.

The extreme reduction of the expectations of the respondents from the electronic & electrical equipment sector is due to one very large company constituting 85% of the R&D. Without this company, the expectations would increase to around 5.3%, which is still below the almost 9% observed in our past two surveys.

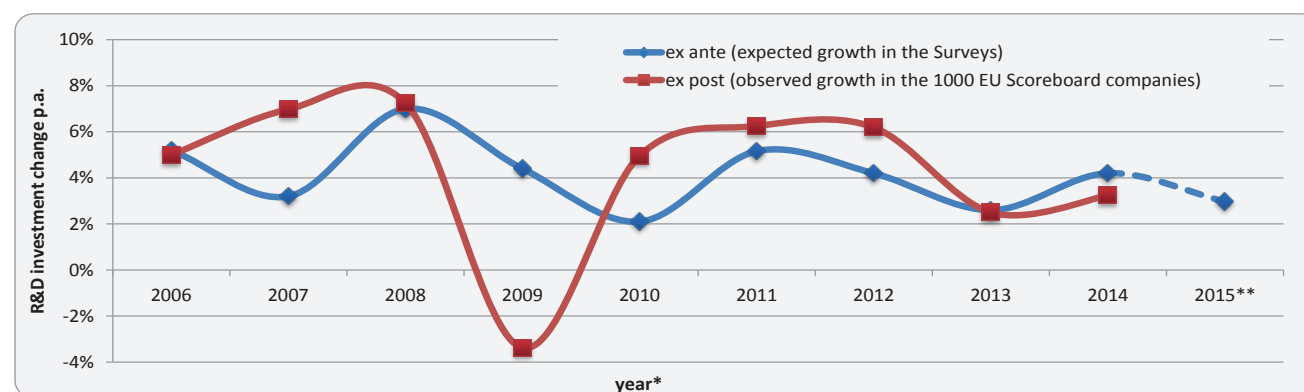
Responses concerning R&D expectations from the automobiles & parts sector constitute half of the R&D for which expectations were issued, so the sample average expectations are thus marked by those from that sector. Compared to the negative expectations for this sector two years ago (-0.4% in the 2013 Survey), R&D investment expectations are back to a healthy growth level (3.7%).

The 2015 forecast for the increase in R&D by 90 US companies is very similar as that reported here by the EU companies surveyed. More than two-thirds of these US companies expect little or no change of R&D (up to 5%), 13% an increase above 5% and 14% expect a decrease.²⁰

The R&D investment growth expectations collected in our surveys are compared with the R&D investment trends observed in the 1000 EU Scoreboard companies in Figure 8.

The figure compares the different Survey and Scoreboard exercises and thus contains samples which not only differ in size²¹ but also in their sectoral composition. In addition, there is around 1.5 year delay between ex post audited figures in the Scoreboards and ex ante expectations in the Surveys. The figure shows that the figures of the 1000 EU Scoreboard companies generally follow the trend of those anticipated by the Survey respondents. The expected growth rates of the Surveys for the years 2013 and 2014 have been very close to the ex-post trends observed for the 1000 EU Scoreboard companies.

Figure 8: Expected (surveys) versus observed (Scoreboards) R&D investment changes



Note: * For the Scoreboard referring to the financial year of the latest annual accounts, while Survey growth expectations are for the three calendar years following the exercise. The numbers are weighted by R&D investment and the samples of every year of the Scoreboard and Survey exercises vary in composition.

** expectations as of the current Survey

Source: European Commission JRC-IPTS (2015)

20 'The Industrial Research Institute's 2015 R&D Trends Forecast', Research-Technology Management, January–February 2015 (see http://www.iriweb.org/Public_Site/RTM/Volume_58_Year_2015/January-February_2015/2015_RandD_Trends_Forecast.aspx). This forecast is based on a survey of 107 US-based companies and indicates a stagnation in R&D in these companies owing to the challenging business landscape. The abovementioned forecast by Battelle and the present survey show more optimistic expectations for R&D, which seem to be the result of an improved economic environment, which is also observed in the official GDP estimates. The responses for the Industrial Research Institute's forecast were collected eight months before ours.

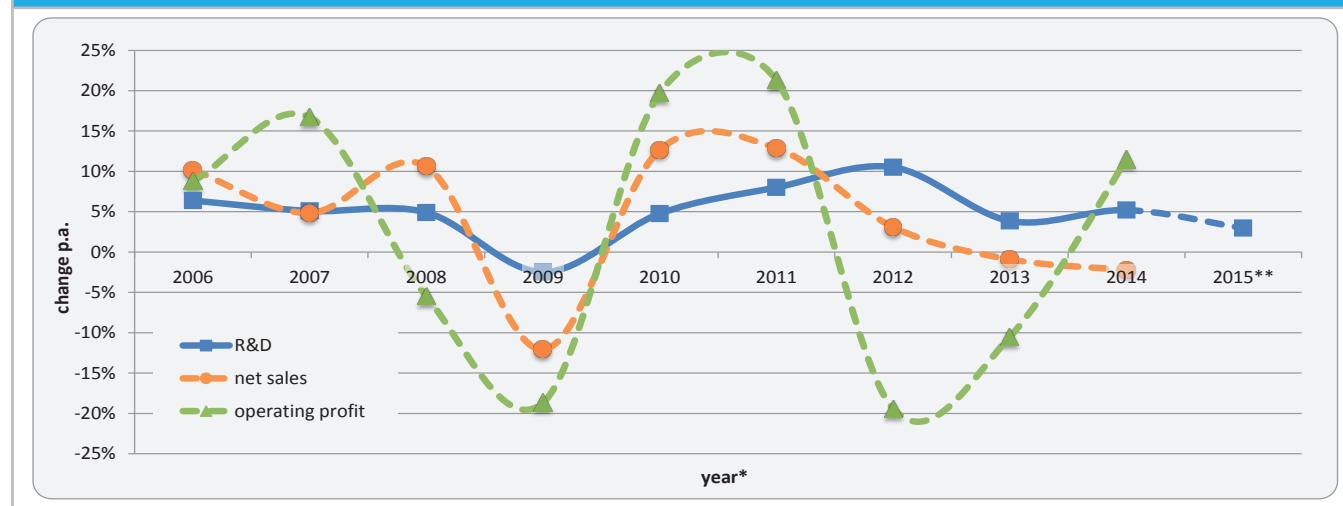
21 The EU Scoreboard contains 1 000 companies of which 15 to 20% participated in the annual Surveys.

For the current Survey sample of 162 companies, Figure 8 below compares the R&D, net sales and operating profit trends as observed in the latest Scoreboard and combines them with the R&D expectations in the present Survey for 2015 onwards.

The ex post trends of the R&D investment in the sample (Figure 9) and the previous Scoreboards (Figure 8) follow

a similar pattern. The net sales and operating profit trends seem similar to the R&D trends, but are more pronounced. Although the companies in the sample experienced negative net sales and operating profit growth in 2013, the trends anticipated by the Survey point to a stable R&D investment growth at around 3-4% p.a from 2013 onwards. This is somewhat lower than the level of the periods between 2010-2012 and before 2008.

Figure 9: Main observed Scoreboard figures of the companies in the sample



Note: * For the Scoreboard referring to the financial year of the latest annual accounts. For to 129 out of the 162 EU companies in the sample, weighted by R&D investment.

** expectations as of the current Survey

Source: European Commission JRC-IPTS (2015)

3 Key Enabling Technologies (KETs)

The Commission is undertaking initiatives to strengthen KETs for the development of new goods and services.²² In order to gain a better understanding of companies' perspective on KETs and their relationship with other important technologies, a typology of technological fields was provided in the questionnaire. It includes the five **core KETs**:²³

1. **Advanced materials** leading to lower-cost substitutes of existing materials and new higher value-added products & services;
2. **Industrial (white) biotechnology** applied to industrial processing and production of chemicals, materials and fuels;
3. **Micro- and nanoelectronics**, e.g. semiconductor components and highly miniaturised electronics,
4. **Nanotechnology**, i.e. design, production and application of structures, devices and systems by controlling shape & size at nanometric scale; and
5. **Photonics**, i.e. conversion of sunlight into electricity, photodiodes, LEDs and lasers.

A further category was added for a range of advanced manufacturing technologies identified as critical in the 2012 Industrial Policy Communication:²⁴

6. **Advanced Manufacturing Technologies (AMTEC)** encompass the use of innovative technology to improve products or processes that drive innovation, including all production equipment that deploys a KET or any other innovative technology.

Another three categories were added in order to consider related and socially or environmentally relevant technologies:

7. **Other (red and green) biotechnology** applied to medical and agricultural processes;
8. **Environmental technologies (incl. alternative energy)**, i.e. devices, materials, and techniques for pollution prevention, reduction or containment, and
9. **Key software technologies**, e.g. high performance computing, building data value, social computing, internet-based applications, embedded systems, human-centred computing, enterprise applications and the generation of software-intensive systems.²⁵

Free space was provided for the respondents to **name other technologies especially relevant for the company** not covered in the above classification.

The respondents were asked to estimate the approximate numbers of patents filed, the revenue from licences issued, the expenditure on licences used and the amount of R&D for each technological field in the past year (2014, in €).

²² These KETs enable the development of new goods and services and the restructuring of industrial processes needed to modernise EU industry and make the transition to a knowledge-based and resource-efficient economy. While the EU has very good R&D capacities in some KETs, it has not always been successful in translating research results into commercialised manufactured goods and services. The Commission's KET strategy aims to boost the industrial production of innovative KET-based products and applications in the future (see: http://ec.europa.eu/enterprise/sectors/ict/key_technologies/).

²³ According to section 2 of the Staff Working Document (see: http://ec.europa.eu/enterprise/sectors/ict/files/staff_working_document_key_enabling_technologies_en.pdf).

²⁴ The European Commission's 2012 Industrial Policy Communication (see: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2012:0582:FIN:EN:PDF>) aims to boost the contribution to GDP of industry in Europe from its current level of around 16% to 20% by 2020. To achieve this ambitious target, the European Commission has engaged in a partnership with the Member States and industry to step up efforts to boost the market uptake of European AMTECs and give Europe a competitive lead in the new industrial revolution (see: http://ec.europa.eu/enterprise/policies/industrial-competitiveness/industrial-policy/task-forces/amt/index_en.htm).

²⁵ According to the 2012 ISTAG report: <http://cordis.europa.eu/fp7/ict/docs/istag-soft-tech-wgreport2012.pdf>.

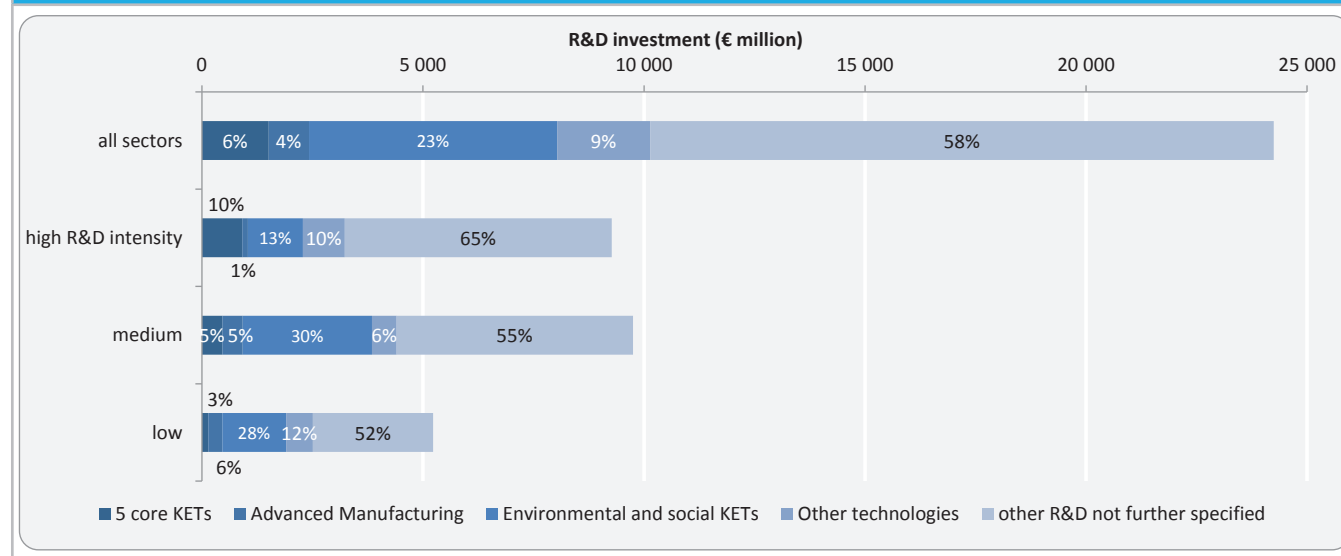
Technological content of R&D by technology group

Just as observed in previous years this question suffers from a high non-response compared to the other questions in the Survey, probably because it is not easy to quantify the R&D in term of its technological content. Only slightly more than half of the respondents (90 out of 162)²⁶ reported a breakdown of their R&D investment in KETs and other relevant technologies. As shown in Figure 10 below, environmental and social KETs alone constitute almost a fourth of the overall 2014 R&D investment of the responding companies, and all KETs together represent one third of their R&D.

On average, the 5 “core” KETs make up for 6% of the R&D investment, ranging from the average 10% of the high R&D intensity firms to the average 3% of those belonging to the low R&D intensity group. Combined with Advanced Manufacturing, the overall percentage of R&D invested rises to 10%.

If we have a closer look at the different R&D intensity groups, the companies investing higher shares of R&D in KETs are in the medium R&D intensity group (around 40%), followed by those belonging to the low (around 37%) and high (around 24%) R&D intensity ones. Similar to what was observed for the overall sample, R&D investment is mainly concentrated in the environmental and social KETs.

Figure 10: R&D investment in KETs and other relevant technologies



Note: The figure refers to 90 out of the 162 EU companies in the sample.

Source: European Commission JRC-IPTS (2015)

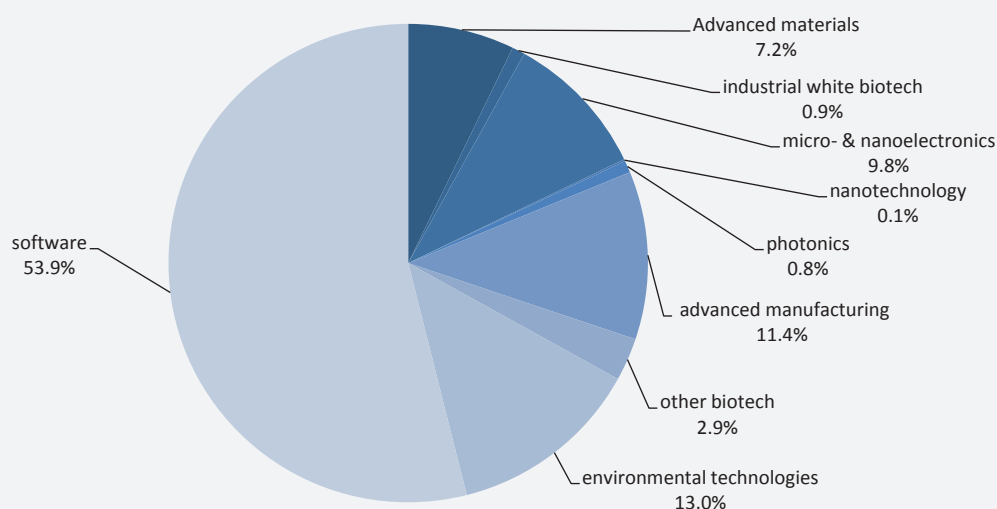
²⁶ Corresponding to 56% of the respondents. This percentage is slightly higher among the firms belonging to the high R&D intensity group (60%) and goes down according to the R&D intensity of the group considered (56% for the medium and 49% for the low R&D intensity groups respectively).

Figure 11 disaggregates the overall KETs investment according to each single kind of technology surveyed. Not surprisingly - given the predominance of environmental and social KETs investment highlighted above - software is the key enabling technology accounting for the majority of the R&D invested (54% of the overall KETs investment reported) followed by environmental technologies (13%) and advanced

manufacturing (11%). Very small R&D amounts were reported in nanotechnology, industrial biotech or photonics.

The overall observed pattern of KETs investment concentration tendency stays true also disaggregating the data according to the different R&D intensity groups. Software is for every group the technology where the majority of KETS investment is concentrated.

Figure 11: R&D investment in KETS - detailed



Note: The figure refers to 80 out of the 162 EU companies in the sample.

Source: European Commission JRC-IPTS (2015)

Number of patents

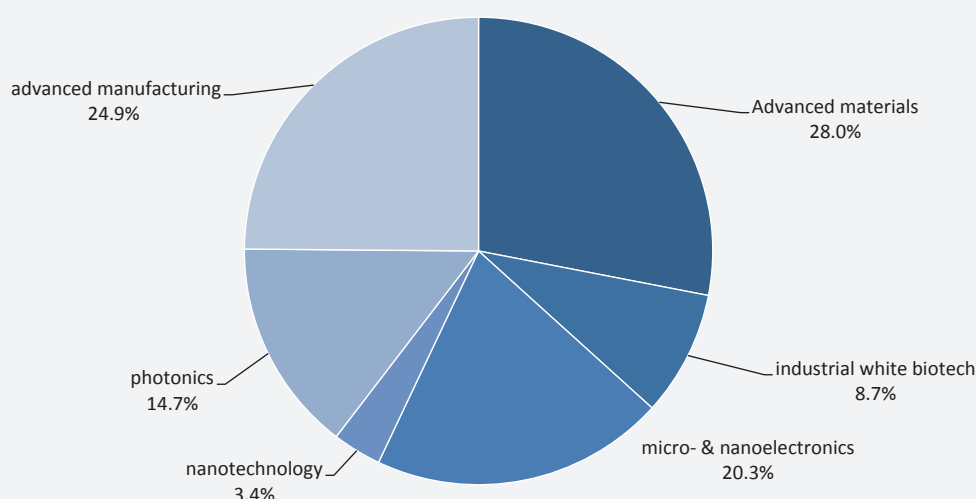
In order to better understand the framework of patents filed in KETs and other relevant technologies by the respondents to our Survey, the historical patterns of patent filing in KETS by the 1000 EU companies in the 2014 Scoreboard is examined in this section. Patent filings by the Scoreboard companies were retrieved using data compiled in the context of the JRC project on Advanced Manufacturing for Competitiveness (AMTEC). This project analyses patent applications and transnational patent-related indicators from the Worldwide Patent Statistical Database (PATSTAT) for patents filed by the EU R&D Scoreboard companies between 2000 and 2011.

PATSTAT is a relational database which is updated twice a year²⁷ containing information about published patents from 83 patent authorities worldwide, dating back to the late 19th century. All information that is provided on a patent application is included in the corresponding PATSTAT entry. Patents are classified according to their main technical fields in the International Patent Classification (IPC). The IPC is a classification scheme with about 70 000 classes (IPC codes) as referred to in the patent documents. These different classification places are arranged in a tree-like, hierarchical structure. In order to account for technological change, the IPC is updated annually and revised every three years. Existing data are adjusted to the current version of the IPC. For the purpose of the present study, the IPC classes that identify KETs and Advanced Manufacturing Technologies are those developed within the course of the European Commission's "KETs Observatory".²⁸

The patent applications considered here are not restricted to those filed at national offices, but also transnational patents. Filing a patent at a national office implies that the market is secured for the potential sale of products associated with a given invention. Analyses of filings at national offices, however, are biased towards the respective domestic applicants ("home advantage" of patent applicants of the respective countries). Therefore, besides regarding patent filings at the European Patent Office (EPO), we focus on the concept of transnational patents in order to overcome the home advantage of domestic applicants and be able to compare technological strengths and weaknesses of different companies. In detail, all applications filled through the Patent Cooperation Treaty (PCT) are counted whether transferred to the EPO or not, as well as all direct EPO applications without precursor PCT application. Double counting of transferred Euro-PCT applications is thereby excluded. The analysis is based on patent data from the April 2014 version of PATSTAT. It usually takes around 18 months between the initial filing of a patent application and the creation of the corresponding entry into PATSTAT. For that reason, the data used here concern the years between 2000 and 2011.

Figure 12 shows the proportion of KETs related patent filings from the EU1000 companies between 2000 and 2011. Slightly over half of the transnational patents that have been filed by the EU1000 companies over this period are related to Advanced Materials (28%) and Advanced Manufacturing Technologies (25%) together. The proportion of Micro- & nanoelectronics related patents is slightly above 20%, whereas nanotechnology-related patents represent only 3% of the total.

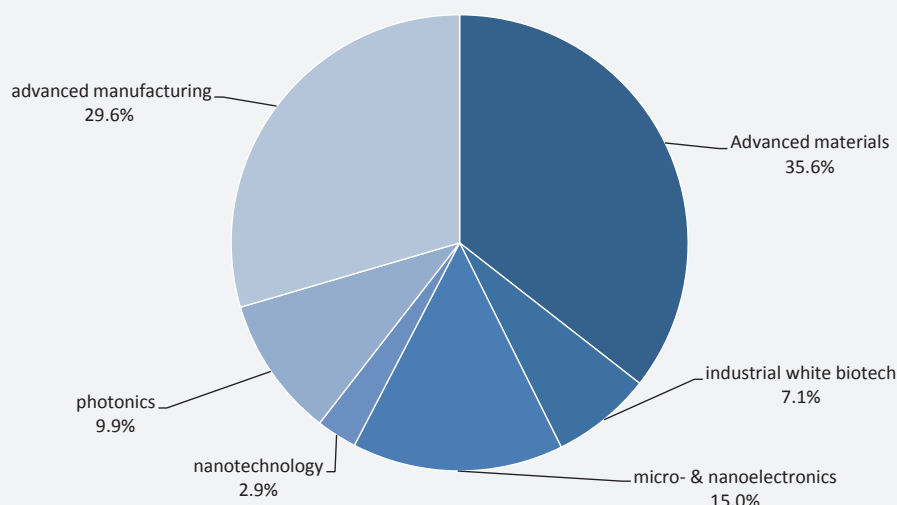
Figure 12: Number of KETs patents filed by EU1000 companies 2000-2011



Source: Scoreboard data combined with patent data from the JRC project on Advanced Manufacturing for Competitiveness (AMTEC)

²⁷ PATSTAT updates take place in April and October each year

²⁸ <https://ec.europa.eu/growth/tools-databases/ketsobservatory/>

Figure 13: Number of KETs patents filed by Survey 2015 companies 2000-2011

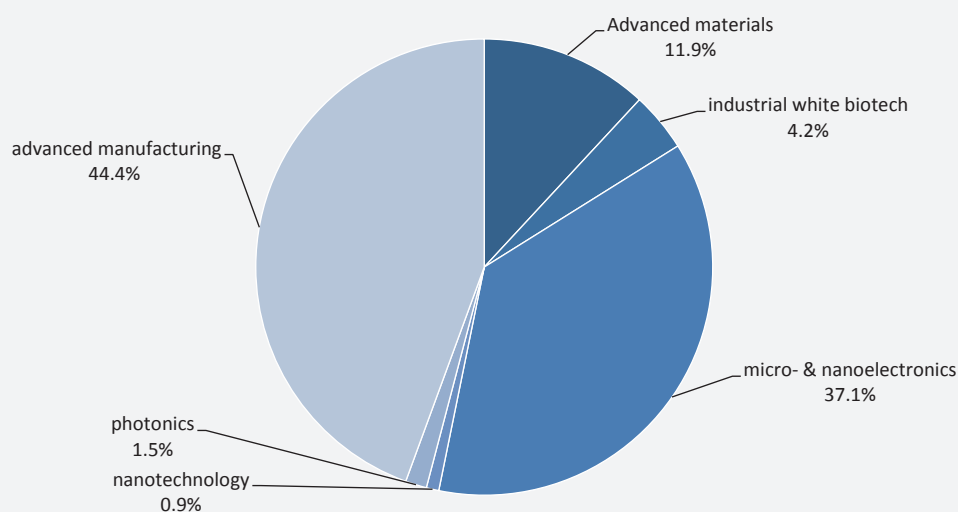
Note: 108 companies out of 162 filed patents during this period

Source: JRC project on Advanced Manufacturing for Competitiveness (AMTEC)

For our Survey respondents, the proportion of Advanced Materials and Advanced Manufacturing Technologies related patents in their portfolios is considerably higher than the proportion of the corresponding patents in the portfolios of the EU1000 companies for patents filed between 2000-2011. On the other hand the proportion of Micronanoelectronics and Photonics related patents is lower than in the case of the EU1000.

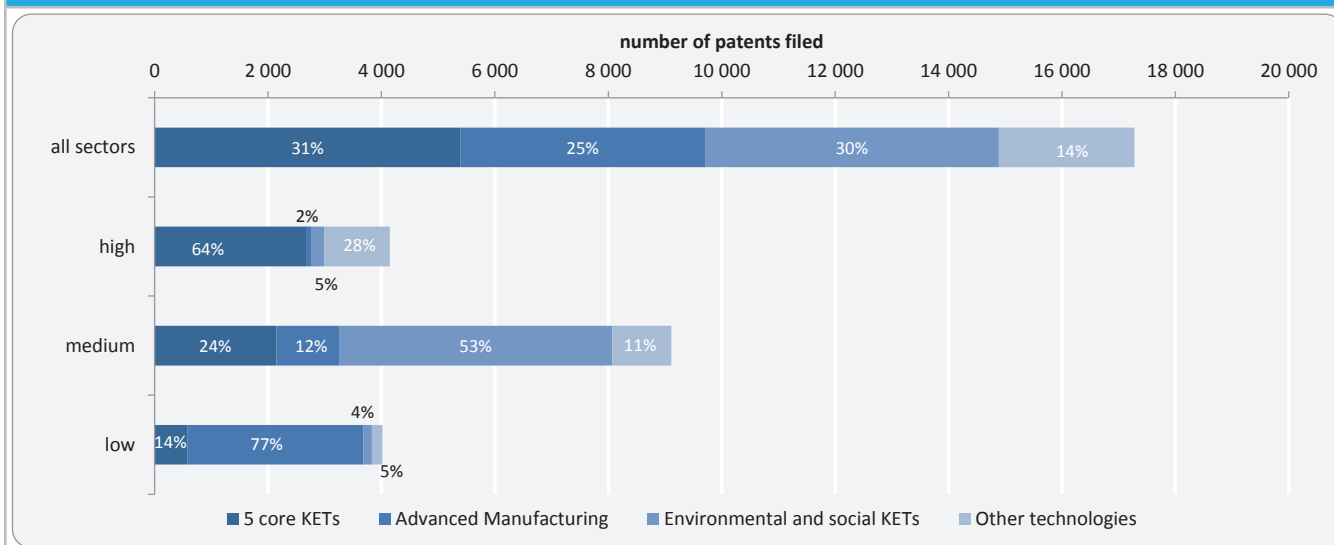
Examining the data reported on patents filed only in 2014 for respondents to our survey in Figure 14 below, the overall picture is quite consistent with the historical pattern shown

in the figure above. In both cases in fact, if we focus only on the technologies for which the comparison is possible (so the 5 core KETS and advanced manufacturing), the three KETs where the majority of patent activity is concentrated are the same. The difference we observe – mainly the weight of photonics patents, which is significant higher for the period 2000-2011 compared to the data reported for 2014 – can be due both to the different sources and period coverage of the data. Moreover, of the 162 companies, only 66 are in both databases: for 42 we have only data coming from the JRC project on Advanced Manufacturing for Competitiveness (AMTEC), for 32 we have data only coming from the Survey, while for 22 we don't have any patent information.

Figure 14: Number of KETs patents filed in 2014 reported by Survey 2015 companies

Note: The figure refers to 84 out of the 162 EU companies in the sample.

Source: European Commission JRC-IPTS (2015)

Figure 15: Number of patents filed by technological group

Note: The figure refers to 98 out of the 162 EU companies in the sample.
 Source: European Commission JRC-IPTS (2015)

If we enlarge the focus on all the patents filed reported by the respondent firms (so including also environmental and social KETs), we can see they are fairly distributed among the different kind of technologies surveyed, with the group of the 5 “core” KETs, representing the relative majority (31%) as shown in Figure 15. The medium R&D intensity group is the one reporting the majority of patents, followed by the high and low ones. The distribution of filed patent among the different KETs observed inside each R&D intensity group is quite uneven, with the 5 core KETs representing 64% of the patent filed by the high R&D intensity firms and the environmental and social KETs account for 77% of the patents filed by low R&D intensity firms.

Considering each KET technology individually, the most represented in terms of patents are environmental technologies (31%), advanced manufacturing (29%) and micro-nanotech (24%). This result can be explained if we disaggregate the data according to R&D intensity group, with each of the groups concentrating its patent activity in one of the three aforementioned KETs (the medium R&D intensity in the environmental technologies, the low R&D intensity in advanced manufacturing and the high R&D intensity in micro-nanotech).

Interestingly, although software represents 54% of KETs-related R&D investment, it only accounts for 3% of the reported filed patents. This could be due both to the time lag between R&D investment and obtaining a patent, compared to which the software product cycles are relatively short, and the limits in software patentability.²⁹

Revenues from licences issues and expenses for licences used

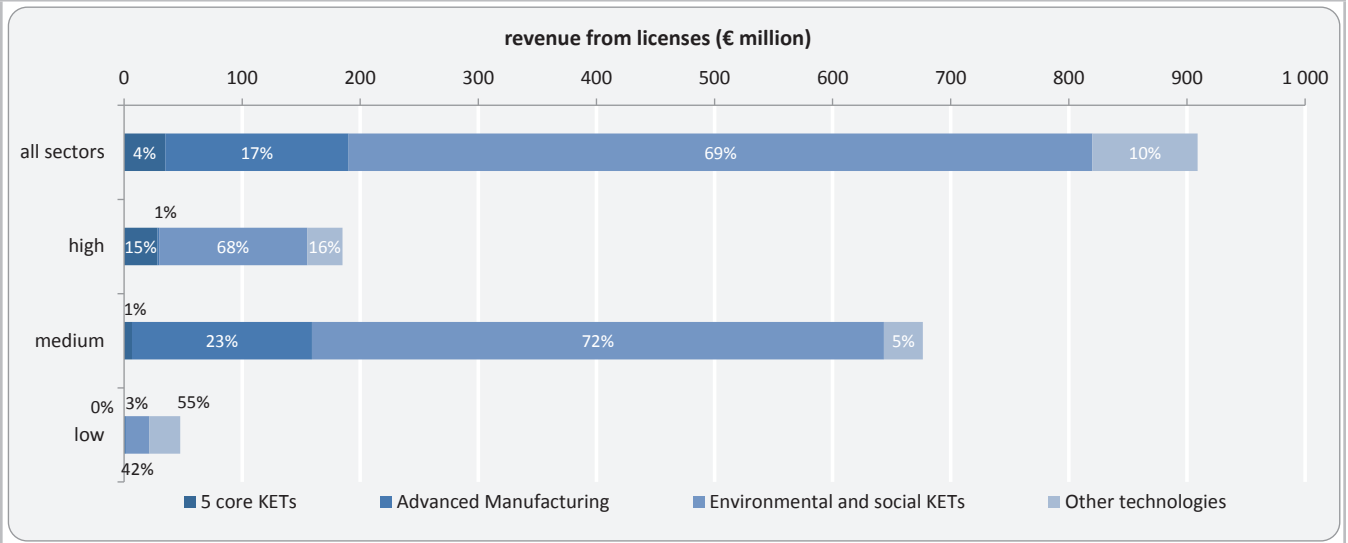
Figure 16 shows the revenues from KETs licenses issued reported by surveyed firms, while Figure 17 illustrates the expenses for KETs licences used by respondents firms.

Out of 162 respondents, 48 (30%) answered to the question on revenue from KETs and other relevant technologies licences. There is a clear concentration of the revenues, with the majority of them coming from the environmental and social KETs (69%). The firms belonging to the medium R&D intensity group collect around 75% of the overall declared revenues, while those collected by the low R&D intensity group represent only a 5.2% of the total.

A similar percentage of firms (42 out of 162, equal to 26%) answered to the question on expenses for license in KETs and other relevant technologies. As for the revenues, also expenses for KETs are concentrated in the environmental and social KETs (81%).

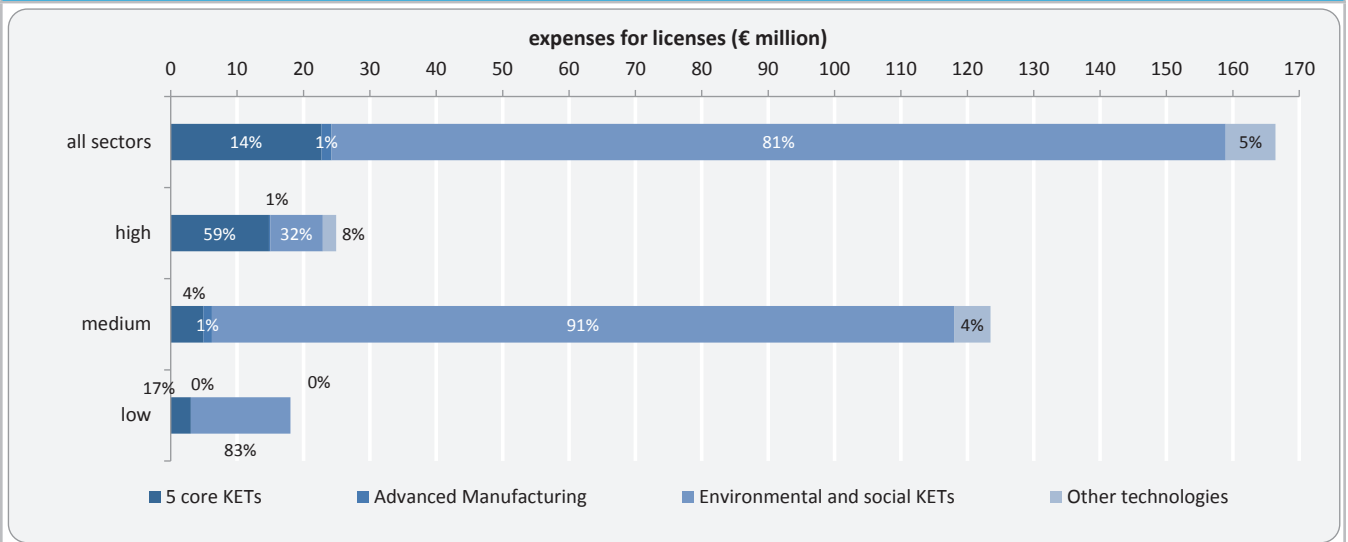
And again, the same concentration we have seen in the medium R&D intensity group at revenue level can be observed when it comes to expenses, with this group alone accounting also in this case for almost 75% of the overall expenses declared in the questionnaire.

29 See also: <http://recode.net/2014/06/19/supreme-court-recognizes-limits-in-software-patentability/>

Figure 16: Revenue from licenses

Note: The figure refers to 48 out of the 162 EU companies in the sample.

Source: European Commission JRC-IPTS (2015)

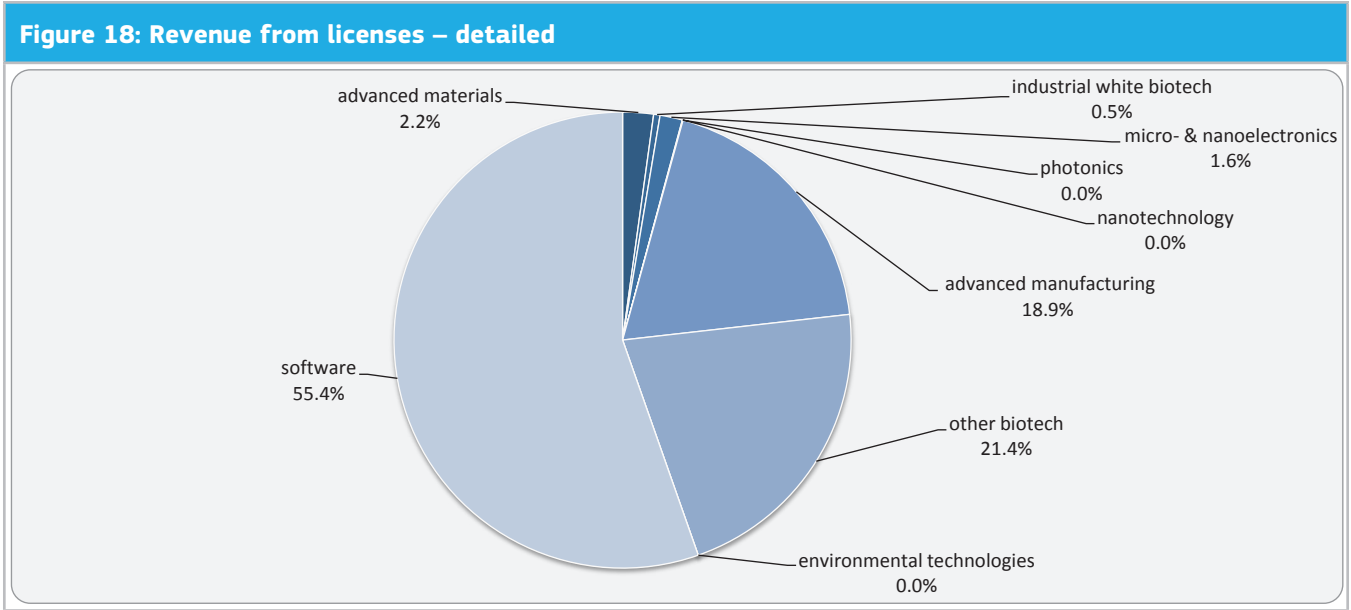
Figure 17: Expenses for licenses

Note: The figure refers to 42 out of the 162 EU companies in the sample.

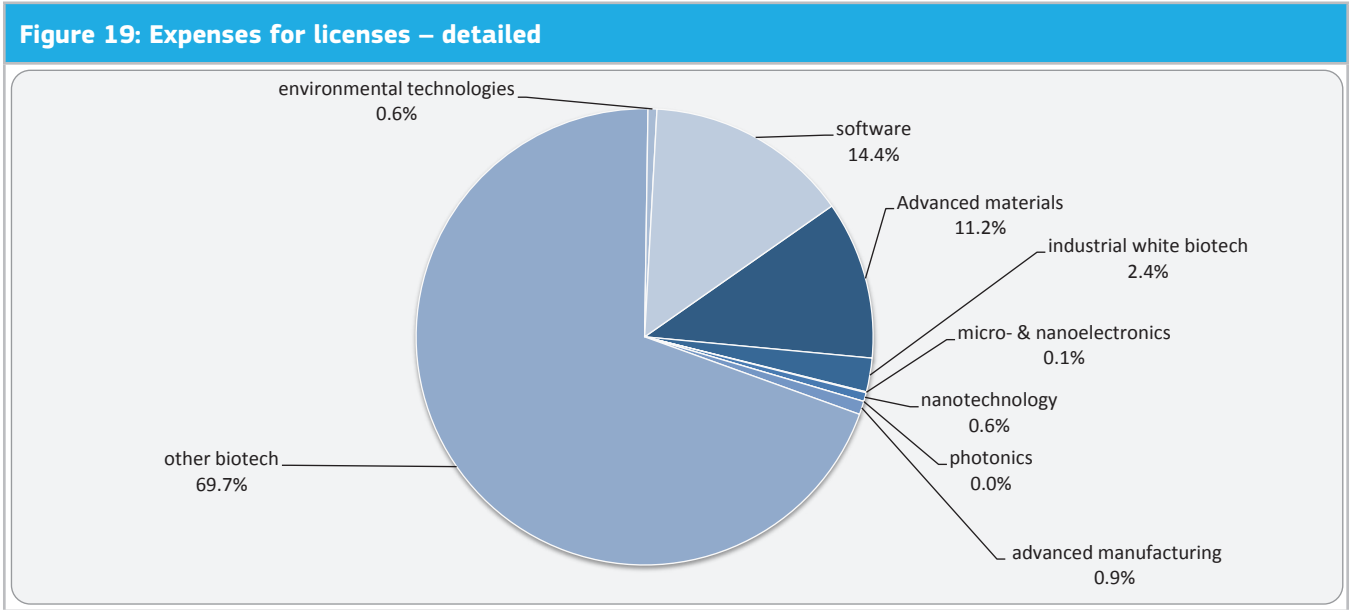
Source: European Commission JRC-IPTS (2015)

A more detailed look at revenues from and expenses for KETs licences for each technology field is provided in Figure 18 and Figure 19 below. In line with the already observed predominance of environmental and social KETs, the majority

of the revenues are coming from software followed by other biotech. This pattern holds true when we disaggregate by R&D in tensity group.



*Note: The figure refers to 42 out of the 162 EU companies in the sample.
Source: European Commission JRC-IPTS (2015)*



*Note: The figure refers to 42 out of the 162 EU companies in the sample.
Source: European Commission JRC-IPTS (2015)*

4 R&D Investment Location

This survey captures R&D investment location by world region via both the current distribution (stock) of R&D investment and the distribution of the expected changes in R&D investment (dynamics). The current distribution in terms of shares of total R&D investment in each of the seven world regions is displayed in Figure 20 below.

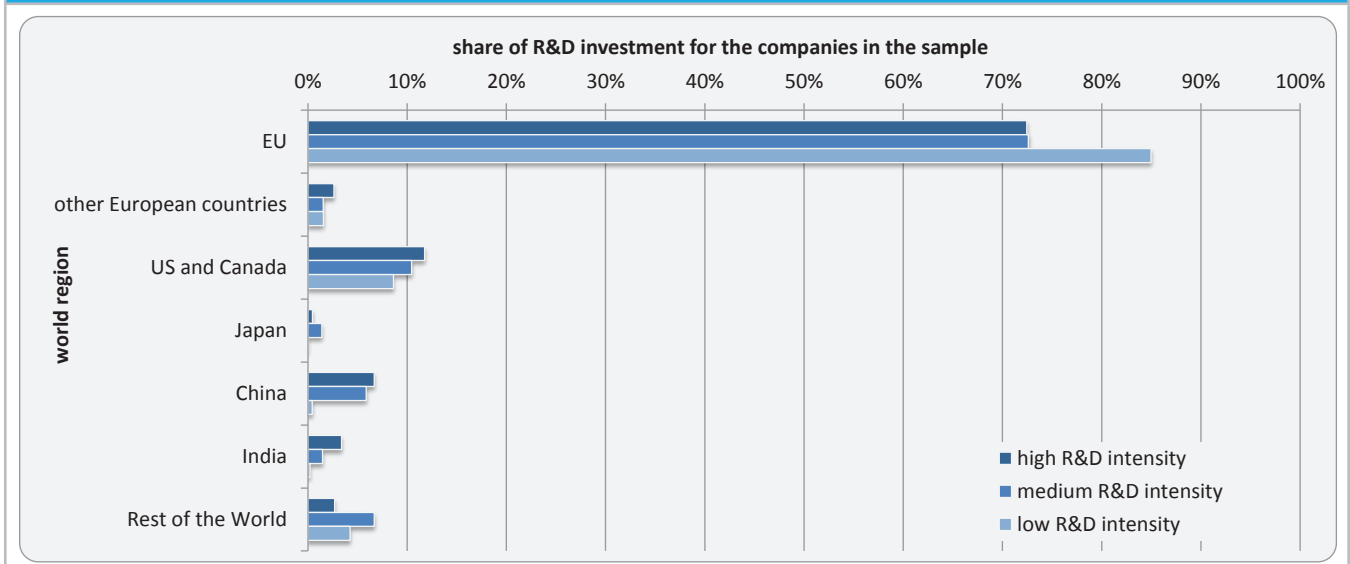
The EU-based companies in the sample carry out one-fourth of their R&D outside the EU (26%), which is very similar to the findings of our four previous surveys. The largest share of R&D investment outside the EU is in the United States and Canada (11%), followed by China (6%), the rest of the world (6%), India (2%), other European countries (1%) and Japan (1%).

Another finding very similar to those of our previous surveys is the observation that the combined share of R&D investment carried out in China and India remains at a low level overall for the European companies surveyed (around

8%). Their share of R&D investment by EU companies is slowly increasing, but relatively low considering those countries' rising share of global production and GDP.

The location distribution of R&D investment by sector group is somewhat different to that seen in previous surveys. Whereas previously companies in the medium R&D intensity sectors had the largest share of R&D investment within the EU, these are now those in the low R&D intensity sectors (85%). This is mainly due to changes in the sample composition, where the companies from medium R&D intensity sectors (especially automobiles & parts, fixed line telecommunications and general industrials) reported lower and some from high R&D intensity sectors (mainly pharmaceuticals & biotechnology) higher R&D investment shares inside the EU. Thus, in this year's sample, medium R&D intensity companies are as internationalised as those from the high R&D intensity ones (almost 30% of R&D outside the EU).

Figure 20: Distribution of R&D investment by world region and sector group



Note: The figure refers to 149 out of the 162 EU companies in the sample, weighted by R&D investment. Other EU countries include Switzerland, Norway and others, while the rest of the world includes a heterogeneous set of countries such as South Korea, Taiwan, and Brazil.

Source: European Commission JRC-IPTS (2015)

Figure 21 below reveals the expectations for R&D investment growth in the different world regions by sector group for the overall average.

The distribution in expectations for growth is similar to that observed in our previous surveys. R&D investment expectations for the EU are slightly lower than the average (2.6% per year over the next three years compared to the 3% overall average).

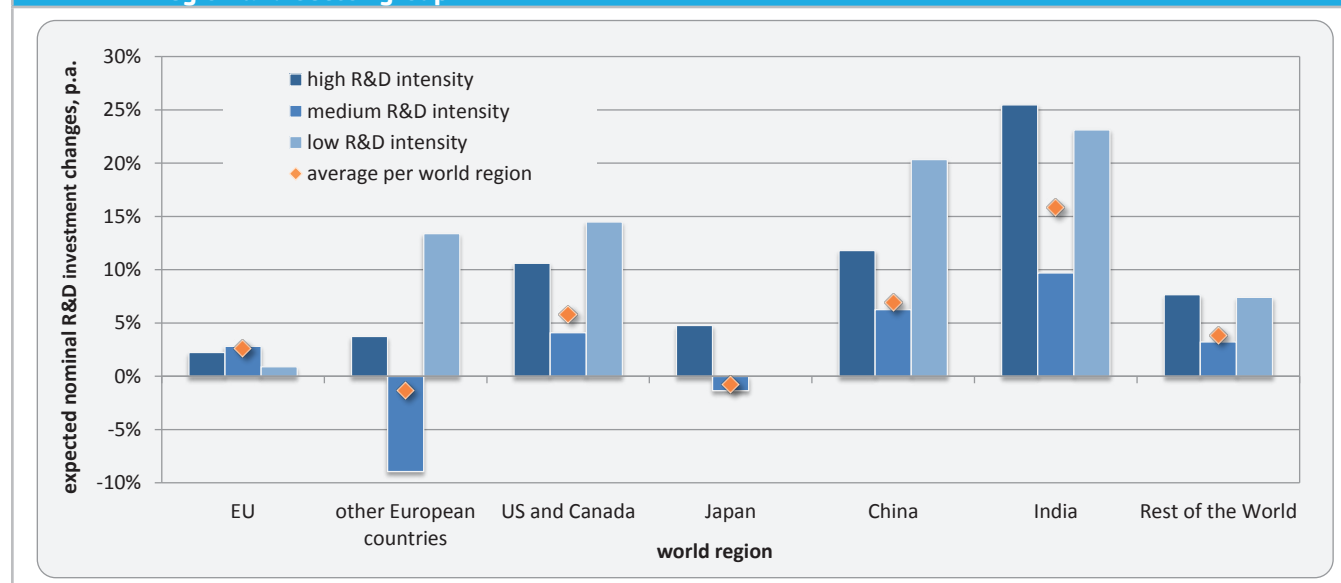
Much higher growth is expected in the non-EU world regions: India (15.8%); China (6.9%); the United States and Canada (5.8%); and the rest of the world (3.8%). Expectations for Japan and other European countries have become slightly negative (-0.8% and -1.3%, respectively) and apply to rather small R&D investment amounts.

In sectors with high R&D intensity, pharmaceuticals & biotechnology and healthcare equipment & services are the drivers of increases in R&D investment in China and India. This contrasts with last year's mixed picture from pharmaceuticals & biotechnology where some companies expected increases and others decreases.

For the medium R&D intensity sectors, R&D investments are expected to decline in other European countries (electronic & electrical equipment and fixed line telecommunications) and, to a much smaller extent, in Japan (industrial engineering).

Concerning the low R&D intensity sectors, expected R&D increases in the EU are much smaller than those in other European countries, the US and Canada, China and India. This is driven by the companies from the industrial metals & mining sector and, for the US and Canada, those from the electricity sector.

Figure 21: Expected changes in R&D investment in the next three years, per annum, in real terms, by world region and sector group



Note: The figure refers to 125 out of the 162 EU companies in the sample, weighted by R&D investment and after elimination of outliers. Other EU countries include Switzerland, Norway and others, while the rest of the world includes a heterogeneous set of countries such as South Korea, Taiwan, and Brazil.

Source: European Commission JRC-IPTS (2015)

If the above expectations materialise, this would lead to a slight future reduction in EU countries' share of R&D investment, while those invested in the United States and Canada, China, India and the rest of the world would increase (Figure 22).

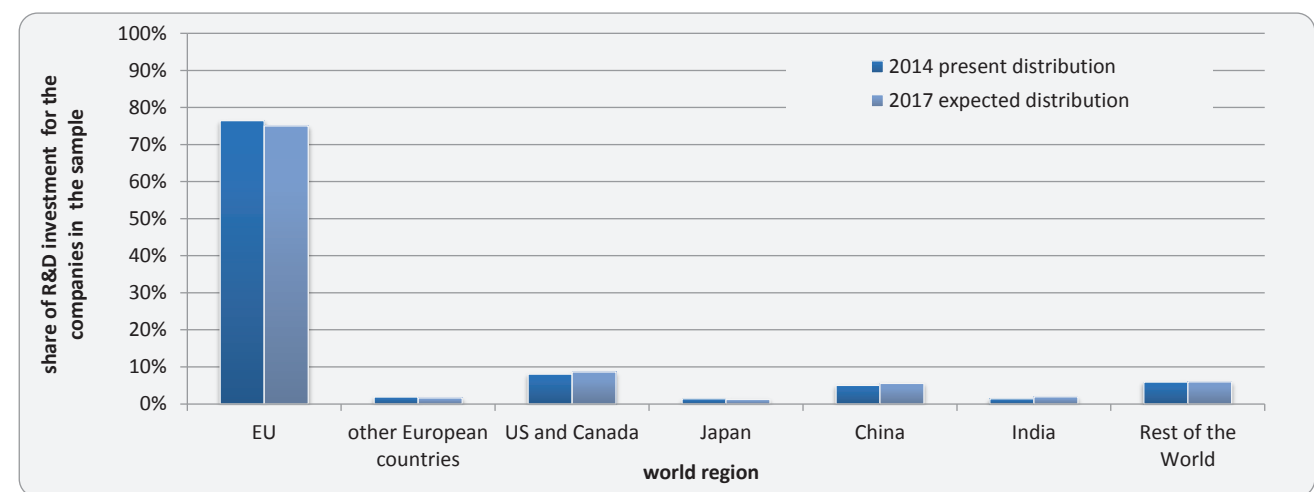
Higher expectations for R&D investment growth outside the EU have also been observed in six of our eight previous surveys where this issue was addressed. As these expectations were within similar dimensions,³⁰ this can be considered a trend. The patterns were always similar, with the highest growth rates expected for China and India, followed by the United States and Canada, while other world regions remained at more modest levels. Expectations for Japan and other European countries have been the most moderate ones for the third year in a row, and are now even negative.

It should be pointed out that the above picture of a decreasing relative share being invested in R&D in the EU occurs within the context of overall increases in the absolute amounts

invested in R&D in most world regions. The only decreases are expected in Japan and other European countries and concern a relatively small amount (around 2.5% of the total increases).

The expected nominal R&D investment increases R&D in the EU constitute a bit more than half the total (€ 736 million out of € 1212 million per year over the next three years). In other words, R&D investment growth is not expected to continue to follow the present distribution. In the future, a bit more than half of the R&D investment growth will be inside the EU and the rest outside. This has also been observed in our previous surveys, and it reflects the increasing participation of European companies in the global economy, and in particular in emerging economies, while they retain their R&D focus inside the EU. It again confirms that the gap between R&D invested by the surveyed companies in the EU and in countries such as China and India has not widened significantly.

Figure 22: R&D investment shares in 2014 and expected in 2017, by world region



Note: The figure refers to 125 out of the 162 EU companies in the sample, weighted by R&D investment and after elimination of outliers. Other EU countries include Switzerland, Norway and others, while the rest of the world includes a heterogeneous set of countries such as South Korea, Taiwan, and Brazil.

Source: European Commission JRC-IPTS (2015)

³⁰ The only exception was the 2008 survey, where R&D investment was expected to stagnate owing to the impact of the economic and financial crisis in autumn 2008.

5 Attractiveness of Countries for R&D

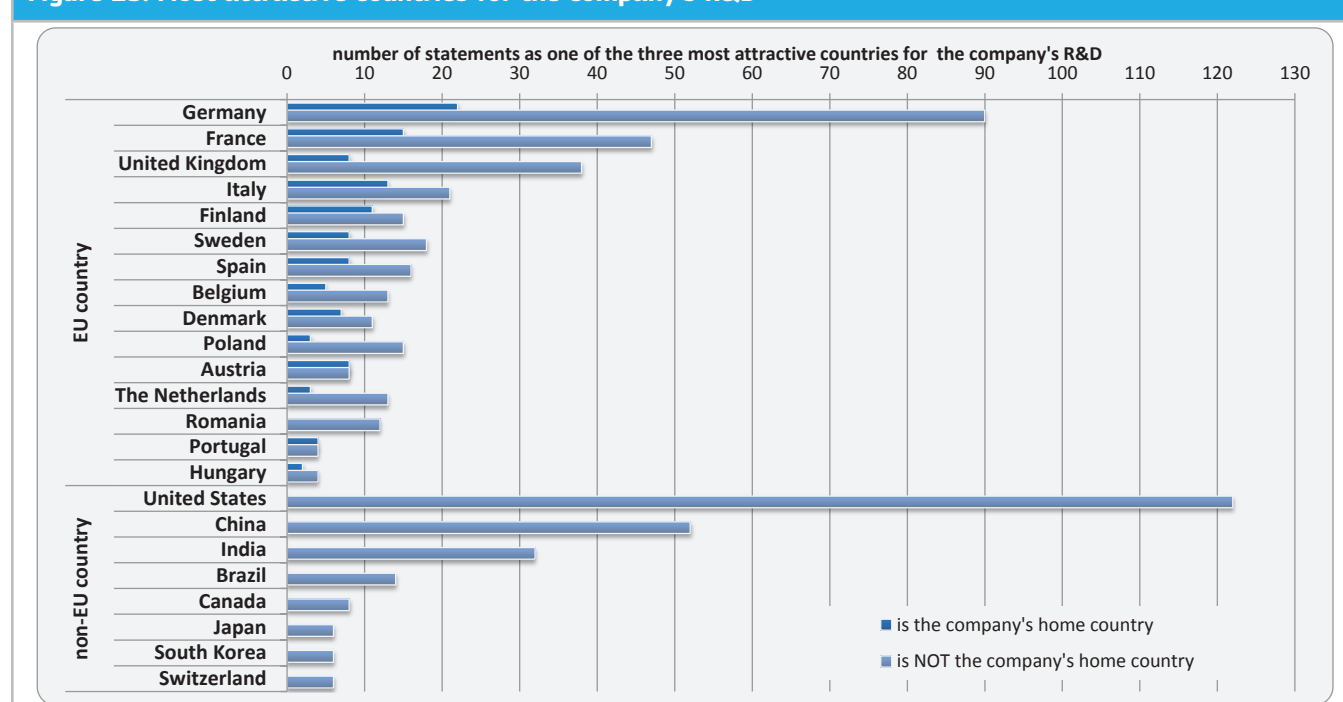
The above considerations on the geographical distribution of R&D investment by world region are further detailed by country-specific questions on the most attractive location for R&D. This also includes a pairwise country comparison of factors for the R&D attractiveness of countries.

Countries considered the most attractive location for the company's R&D

Respondents were asked to state the three countries currently considered the most attractive location for the company's R&D, regardless whether the company has R&D activity there or not. The result is shown in Figure 23 below.

Regarding EU countries, Germany, France and the United Kingdom receive the highest numbers of statements as the most attractive country. For three out of four respondents, their home country is among the three most attractive locations. This is a very similar finding to that of our previous surveys.³¹ Although many of the respondents are headquartered in Germany, France and the United Kingdom, there is however no home-bias towards the three biggest EU Member States.³² The share of respondents favouring their home-country is higher than for the three biggest EU Member States in Italy, Finland, Denmark, Austria, Portugal, and Hungary.

Figure 23: Most attractive countries for the company's R&D



Note: The figure refers to 146 out of the 162 companies in the sample. Numbers of statements refer to one of the three countries currently considered the most attractive location for the company's R&D activities.

Only for countries mentioned at least five times.

Source: European Commission JRC-IPTS (2015)

³¹ As observed in the 2010 and 2008 surveys, more than two-thirds of the respondents considered their home country the most attractive location for R&D, whereas in the 2013 and 2014 surveys, the proportion was exactly two-thirds.

³² see also table 4 in Annex A

Regarding non-EU countries, the United States, China and India are seen as the most attractive locations outside the home country. Poland, The Netherlands and Romania are EU countries with an especially high attractiveness index for companies for which they are not the home country. All the above observations were very similar compared with our previous five surveys.

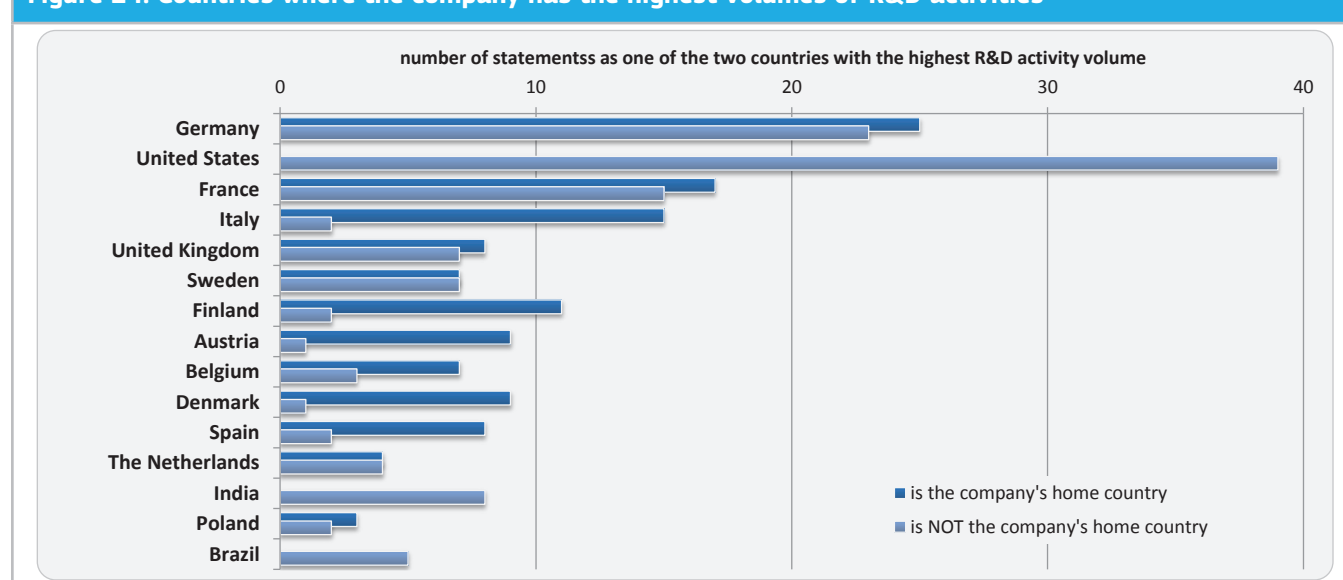
Attractiveness of the two countries where the company has the greatest R&D activity

The respondents were also asked to rate a number of attractiveness factors for the two countries where they have the greatest R&D activity. This question therefore allows for

a pairwise comparison of the actual R&D locations. As might be expected from the observations above (about the most attractive location for the company's R&D), for 9 out of 10 respondents their home country was one of the two with the highest volume of R&D activity (Figure 24).

The biggest EU countries and the United States are the countries in which the respondents have the highest volumes of R&D activity. A large proportion of companies that have their biggest R&D sites in Italy, Finland, Austria, Belgium, Denmark, and Spain are also headquartered in those countries. The opposite is true for Sweden and The Netherlands, where a large share of the biggest R&D sites belong to companies headquartered outside, and for non-EU countries playing an important role in the expansion of R&D investment, such as India and Brazil.

Figure 24: Countries where the company has the highest volumes of R&D activities



Note: The figure refers to 151 out of the 162 companies in the sample. Numbers of statements refer to one of the two countries where the company has the highest volume of R&D activities.

Only for countries mentioned at least five times.

Source: European Commission JRC-IPTS (2015)

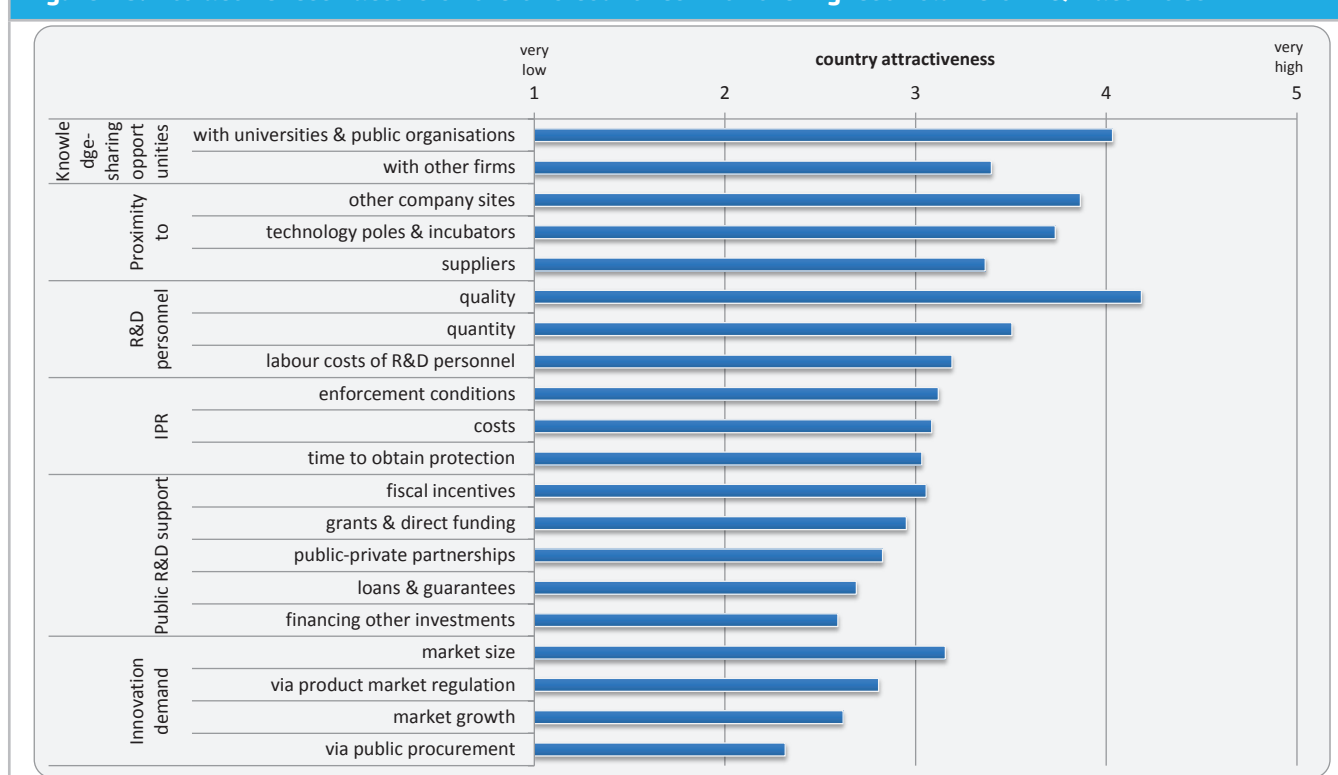
Respondents were asked to rate a number of attractiveness factors important for innovation directly referring to these countries where their companies have the highest volumes of R&D activity (Figure 25).³³

Similar to our previous survey, the factors making countries attractive for R&D are knowledge-sharing and collaboration opportunities (with universities and public research organisations), proximity (to other company sites, technology poles & incubators) and R&D personnel in the labour market (quality, quantity and labour costs). The quality and quantity of R&D personnel in the labour market clearly ranked ahead of labour costs, which are seen as a neutral factor.

Intellectual property rights (IPR) (in terms of enforcement conditions, costs of protection and time to protection), and demand for innovation in terms of market size are perceived as neutral factors for attractiveness.

Most aspects of public R&D support (public-private partnerships, loans & guarantees and financing other investments) as well as Innovation demand (via product market regulation, market growth and public procurement) were not seen as factors for attracting R&D.

Figure 25: Attractiveness factors of the two countries with the highest volume of R&D activities



Note: The factors are grouped by the average relevance of the major items in the survey.

The figure refers to 144 out of the 162 companies in the sample.

Source: European Commission JRC-IPTS (2015)

³³ Innovation is the introduction of new or significantly improved products, services or processes.

Attractiveness of EU countries

For the two countries where the company currently has the greatest R&D activity, this section addresses the attractiveness of 11 EU countries for which at least five statements were received.³⁴ A comparison between EU and

those non-EU countries for which more than five responses were obtained is featured in the next section.³⁵

Table 2 below shows the top three and the least attractive factor for each of the EU countries.

Table 2: Top three and lowest attractiveness factor for EU countries with at least five statements

country (number of statements)	average rating	most attractive	second most attractive	third most attractive	least attractive
Germany (44)	3.19	quality of R&D personnel	proximity to other company sites	knowledge-sharing opportunities with universities & public organisations	public R&D support via fiscal incentives
France (29)	3.15	public R&D support via fiscal incentives	quality of R&D personnel	knowledge-sharing opportunities with universities & public organisations	innovation demand via market growth
Belgium (9)	3.06	quality of R&D personnel	proximity to other company sites	public R&D support via fiscal incentives	innovation demand via public procurement
Finland (12)	3.03	proximity to other company sites	quality of R&D personnel	knowledge-sharing opportunities with universities & public organisations	public R&D support via financing other (non-R&D) investments
Austria (9)	2.94	quality of R&D personnel	proximity to other company sites	public R&D support via fiscal incentives	innovation demand via market size & growth
United Kingdom (14)	2.79	quality of R&D personnel	knowledge-sharing opportunities with universities & public organisations	proximity to other company sites and technology poles & incubators	public R&D support via financing other (non-R&D) investments
Denmark (14)	2.78	knowledge-sharing opportunities with universities & public organisations	quality of R&D personnel	proximity to technology poles & incubators	innovation demand via market size & growth
Sweden (13)	2.78	proximity to other company sites	quality of R&D personnel	knowledge-sharing opportunities with universities & public organisations	public R&D support via fiscal incentives
The Netherlands (8)	2.74	quality of R&D personnel	knowledge-sharing opportunities with universities & public organisations	proximity to other company sites and technology poles & incubators	innovation demand via market growth
Italy (17)	2.66	quality of R&D personnel	knowledge-sharing opportunities with universities & public organisations	quantity of R&D personnel and proximity to other company sites	innovation demand via public procurement
Spain (10)	2.62	quality of R&D personnel	quantity of R&D personnel	knowledge-sharing opportunities with universities & public organisations	public R&D support via financing other (non-R&D) investments

Note: Refers to 151 out of the 162 companies in the sample, numbers of statements per country in brackets ().

Countries are sorted by average attractiveness.

Source: European Commission JRC-IPTS (2015)

³⁴ Sorted by average attractiveness, these are the Germany (44), France (29), Belgium (9), Finland (12), Austria (9), United Kingdom (14), Denmark (10), Sweden (13), The Netherlands (8), Italy (17) and Spain (10).

³⁵ The United States, China and India.

The most frequently stated factors for the above countries are the quality of R&D personnel (11 statements), knowledge-sharing opportunities with universities and public organisations (9) and proximity to other company sites (8). They are followed by proximity to technology poles & incubators (United Kingdom, Denmark and The Netherlands) and quantity of R&D personnel (Italy and Spain). Public support for R&D was among the three most relevant factors for Belgium and Austria (via grants and direct funding) and France (via fiscal incentives).

The factors that are the least attractive centre on demand for innovation via market growth (France, Austria, Denmark, and the Netherlands), market size (Austria and Denmark) and public procurement (Belgium and Italy). Also public R&D support via financing other (non-R&D) investments (United Kingdom and Spain) and fiscal incentives (Germany and Sweden) could improve the attractiveness of countries.

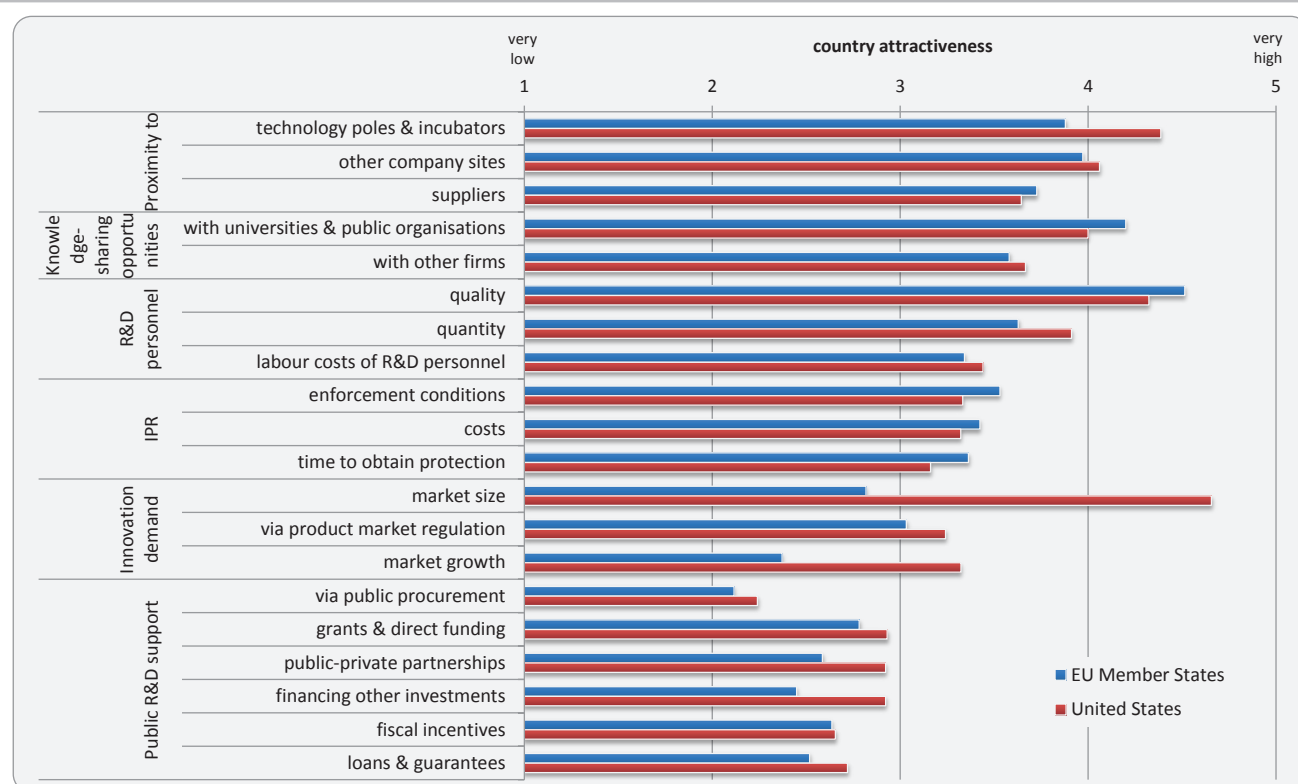
Attractiveness of EU countries versus the US

Considering the possibility for a pairwise comparison, Figure 26 shows the attractiveness of the EU and the United States as either of the sites where the company has the highest volume of R&D activity for 33 actual cases.

The leading three factors are the same as in than last year's survey, with just minor changes in their order. Proximity factors are ahead of knowledge-sharing opportunities and quality and quantity of R&D personnel.

As in our previous survey, respondents considered the United States much more attractive for R&D than the EU regarding market size and growth, whereas the quality of R&D personnel in the labour market was highlighted in EU countries.

Figure 26: Attractiveness of EU countries compared to the US for 33 cases



Note: The figure refers to 33 out of the 162 companies in the sample.

Source: European Commission JRC-IPTS (2015)

Attractiveness of EU countries versus China and India

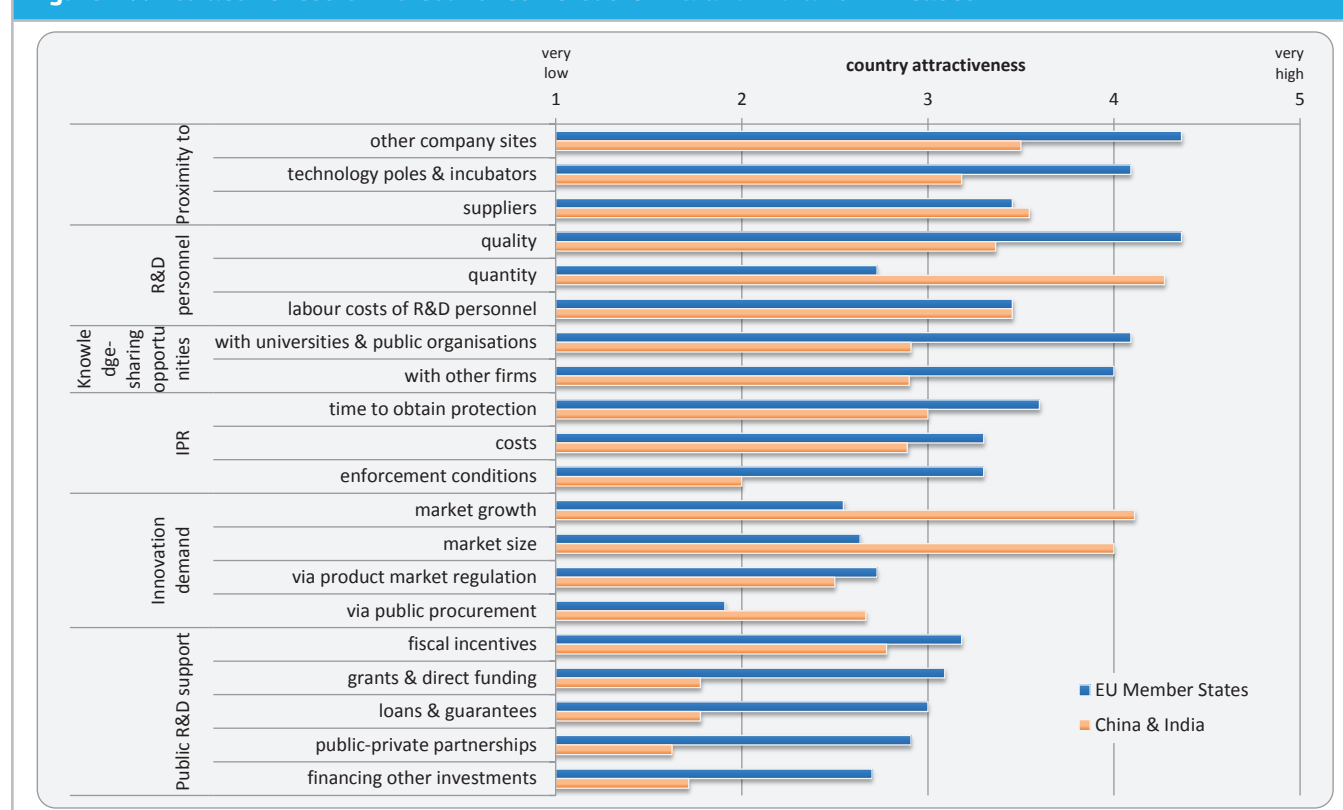
For 11 actual cases, Figure 26 compares the attractiveness of R&D sites in EU countries (highest R&D volume) with those in China and India (second highest R&D volume).

The pairwise comparison between these actual sites in the EU and in China and India confirms the picture of last year's survey. The attractiveness factors are very different between the two world regions. For the R&D sites in the EU, proximity (to other company sites and technology poles and incubators), quality of R&D personnel, and knowledge-sharing opportunities (with universities and public organisations and

other firms) and are the most relevant factors. In addition, IPR factors (especially enforcement conditions) and most aspects of public R&D support (grants & direct funding, loans & guarantees, public-private partnerships and financing other (non-R&D) investments) are seen as much more attractive in the EU than in China and India.

For actual R&D sites in China and India, market size and growth, together with the quantity of R&D personnel, are determinants of attractiveness. It is interesting to note that labour costs of R&D personnel receive a similar perception for both the EU and China and India. Compared with the EU, China and India also lack attractiveness in terms of quality of R&D personnel.

Figure 27: Attractiveness of EU countries versus China and India for 11 cases



Note: The figure refers to 11 out of the 162 companies in the sample.

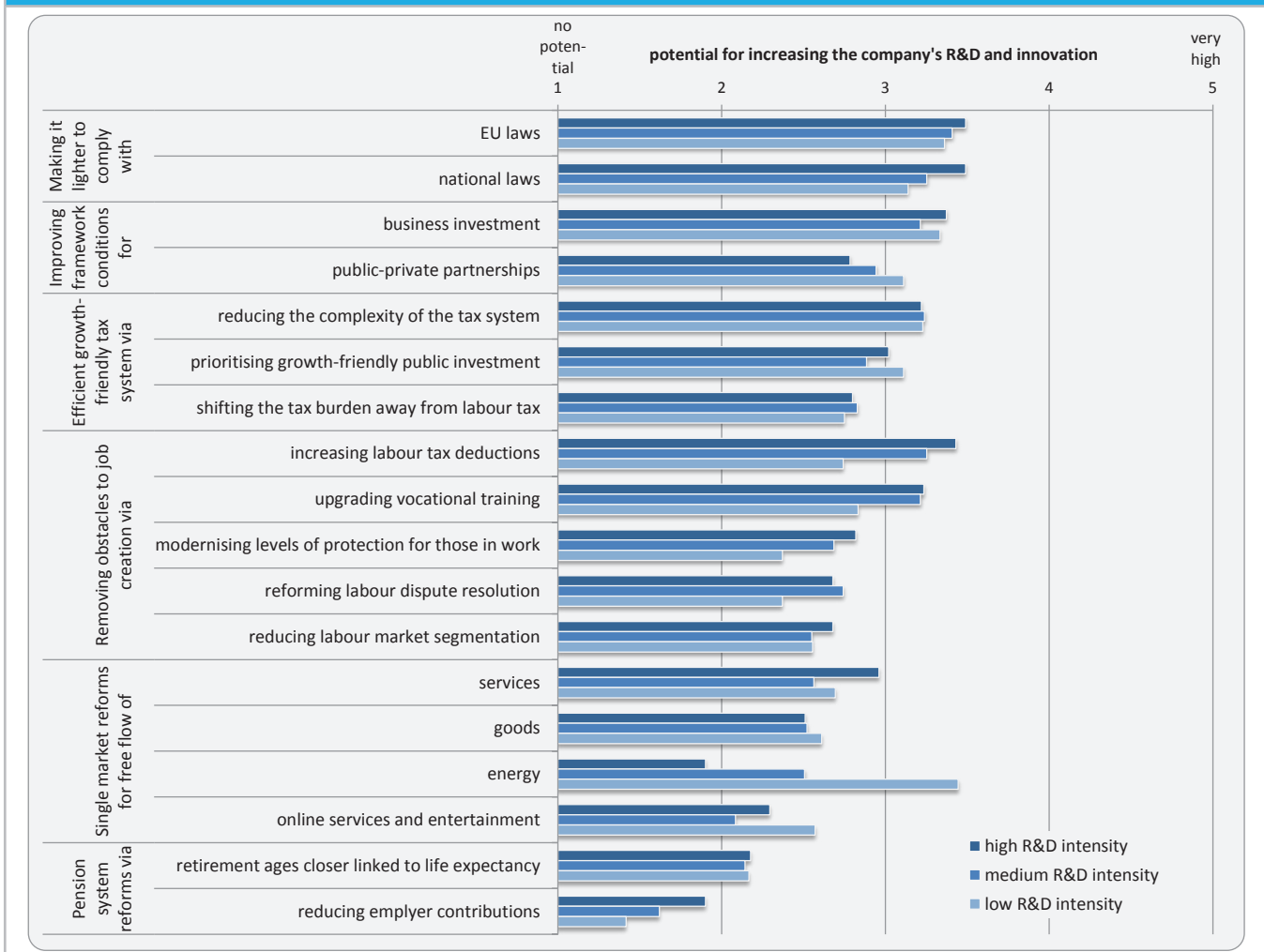
Source: European Commission JRC-IPTS (2015)

6 Structural reforms for R&D

In response to the economic crisis the Commission has undertaken important reforms of the EU's economic governance rules³⁶ pushing for structural reforms. The survey

participants were asked for the potential of a number of initiatives for *increasing* the company's R&D and innovation³⁷ (Figure 28).

Figure 28: Potential of structural reforms for increasing R&D and innovation



Note: The activities are listed by average relevance of the major items in the survey.

The figure refers to 158 out of the 162 companies in the sample.

Source: European Commission JRC-IPTS (2015)

36 See: "The 2015 Annual Growth Survey": http://ec.europa.eu/europe2020/pdf/2015/ags2015_en.pdf

37 Innovation is the introduction of new or significantly improved products, services, or processes.

On average, based on a scale from 1 (no potential for increasing R&D innovation) to 5 (very high potential), all factors except the ones on single market and on pension system reforms ranged between 2.6 and 3.5, and thus have some potential. Within that range, the highest potential was deemed for making it lighter, simpler and less costly to comply with laws (EU and national). This is followed by improving framework conditions (for business investment and public-private partnerships), an efficient and growth-friendly tax system (via reducing complexity, prioritising growth-friendly public investment and shifting the tax burden away from labour tax to others) and removing obstacles to job creation (via increasing labour tax deductions, upgrading vocational training, modernising levels of protection for those in work, reforming labour dispute resolution and reducing labour market segmentation).

Single market reforms (for the free flow of services, goods, energy and online services and entertainment)³⁸ and pension system reforms (closer linking retirement ages to life

expectancy and reducing employer contributions to obligatory employee pensions schemes) were not perceived as having a substantial potential for increasing the company's R&D and innovation.

There are differences between sector groups.³⁹ For companies in the high and medium R&D intensity sectors, removing obstacles to job creation (via increasing labour tax deductions, upgrading vocational training and modernising levels of protection for those in work) show a higher potential for increasing the company's R&D and innovation than for the low R&D intensity sectors. However, the potential of single market reforms allowing the free flow of energy (eliminating energy islands and integrating renewables) for the company's R&D and innovation is substantially higher for the medium and low R&D intensity sectors than for the high R&D intensity ones. This is explained because overall, the energy intensity of the sector groups is inversely proportional to their R&D intensity.

³⁸ The Digital Single Market is the update of EU Single Market rules for the digital era leading to a free flow of online services and entertainment across national borders. The aims are to boost the music download business, establish a single area for online payments, and further protect EU consumers in cyberspace, borders. See: <http://ec.europa.eu/digital-agenda/our-goals/pillar-i-digital-single-market>

³⁹ Only differences of at least 10% between the two values were considered as an indication of a difference.

7 Annex A: Methodology

Background and Approach

The European Commission's Industrial Research and Innovation Monitoring and Analysis (IRIMA)⁴⁰ initiative serves to better understand industrial R&D and innovation in the EU and to identify medium and long-term policy implications. IRIMA is carried out by the European Commission's Joint Research Centre (JRC) – Institute for Prospective Technological Studies (IPTS) and the Directorate General for Research – Directorate A, Policy Development and Coordination. The project monitors and analyses industrial R&D and innovation activities in order to support the implementation and monitoring of the European research and innovation agenda: the Innovation Union flagship, set in the context of the Europe 2020 strategy aiming at a smarter, greener and more inclusive economy. The evidence gathered also contributes to policy-making in the “Industrial Policy”, the “Digital Agenda” and the “New Skills for New Jobs” flagship initiatives.

The present IRIMA surveys tackles the lack of comparable information on business R&D investment trends at the European level by gathering qualitative information on factors and issues surrounding and influencing companies' current and prospective R&D investment strategies. The survey complements other R&D investment related surveys and data collection exercises (e.g. Innobarometer, Eurostat data collection and other on-going surveys).

Link to the R&D Investment Scoreboards

The EU R&D surveys complement the *EU Industrial R&D Investment Scoreboard*⁴¹, which is the main IRIMA product. The Scoreboard helps the European Commission to monitor and analyse company R&D investment trends and to benchmark, inform and communicate developments in R&D investment patterns.

The Scoreboard and the Survey take different perspectives on the industrial R&D dynamics in companies. The Scoreboard looks at trends ex-post based on the audited annual accounts of companies, whereas the Survey improves the understanding of the Scoreboard companies by collecting ex-ante information. The survey also addresses location strategies, drivers and barriers to research and innovation activities, or perception of policy support measures with a questionnaire agreed between JRC-IPTS and DG-RTD. This questionnaire is printed and mailed by post together with the Scoreboard analysis report and the previous Survey analysis report to the 1000 European companies. Also a web-interface and email contacts are made available in order to allow for paperless participation. The Survey makes efficient use of the direct contacts established with the European Scoreboard companies by adding-on to the Scoreboard mailing when the reports are officially released.

For the 2015 Survey, the response period ran for three months: from 12th March (mailing of the questionnaires) to 16th June 2015 (reception of the last response).

40 See: <http://iri.jrc.ec.europa.eu/>. The rationale for the IRIMA activities emerged in the context of the European Commission's “3% Action Plan” established to implement and monitor the 3% R&D investment intensity target of the Lisbon strategy (“Investing in research: an action plan for Europe” (COM, 2003)) and in further Communications of the Commission (“More Research and Innovation – Investing for Growth and Employment – A common approach”, COM (2005) 488 final, “Implementing the Community Lisbon Programme: A policy framework to strengthen EU manufacturing – Towards a more integrated approach for industrial policy”, COM (2005) 474 final). The activity is undertaken jointly by the Directorate General for Research (DG RTD A, see: <http://ec.europa.eu/research/index.cfm>) and the Joint Research Centre, Institute of Prospective Technological Studies (JRC-IPTS, see: <http://ipts.jrc.ec.europa.eu/activities/research-and-innovation/iri.cfm>).

41 The Scoreboard is published annually and provides data and analysis on the largest R&D investing companies in the EU and abroad (see: <http://iri.jrc.ec.europa.eu/research/scoreboard.htm>).

Methodology

To improve response rates, the following measures were taken in the course of the survey cycle:

- (1) The questionnaire was revised and streamlined with a view towards keeping it as short and concise as possible and minimise the burden for the respondent.
- (2) The questionnaire was sent together with the Scoreboard report to take advantage of this occasion as a door-opener.
- (3) The cover-letter presented a full colour figure and table with a benchmarking analysis of the company addressed compared to its peers in the same sector.
- (4) As well as physically sending the questionnaire to each company, an online site was provided to facilitate data entry via the European Commission's EU Survey tool,⁴² where a Word version of the questionnaire was downloadable for offline information input.
- (5) The questionnaire was emailed to the respondents of previous surveys, together with a link to the electronic copy of the latest analysis.
- (6) The contact database was continuously improved. Respondents who had already participated in previous surveys, or their substitutes in cases where they had left their position, were priority contacts. Returned questionnaires and reminder mailings were resent using the latest contact information on the internet or by contacting the company directly via email or phone.
- (7) The response rate is closely followed on a regular basis during the implementation. If necessary, measures for improving the response rate are applied, e.g. by adjusting the number of reminders, allowing more time for questionnaire reception, following up selected candidates by e-mail and phone or searching support from former survey participants
- (8) Personal contact by phone or email was made with several dozen companies when the deadlines were close, especially for those which had participated in the past.

The response rate has been steadily high over the past five years, taking full advantage of the familiarity of the EU Scoreboard companies with the exercise and their mature approach.⁴³

Outliers were detected by analysing the distribution of the dataset in scatter and boxplots and defining upper and lower quartiles ranges around the median, according to the variable(s) analysed. To maintain the maximum information in the data, outliers were eliminated only in extreme cases and after assessing the impact on the result.⁴⁴

One-year growth is simple growth over the previous year, expressed as a percentage: $1\text{yr growth} = 100 * ((C/B) - 1)$; where C = current year amount and B = previous year amount. 1yr growth is calculated only if data exist for both the current and previous year. At the aggregate level, 1yr growth is calculated only by aggregating those companies for which data exist for both the current and previous year.

Three-year growth is the compound annual growth over the previous three years, expressed as a percentage: $3\text{yr growth} = 100 * (((C/B)^{(1/t)} - 1))$; where C = current year amount, B = base year amount (where base year = current year - 3), and t = number of time periods (= 3). 3yr growth is calculated only if data exist for the current and base years. At the aggregate level, 3yr growth is calculated only by aggregating those companies for which data exist for the current and base years.

Unless otherwise stated, the **weighted figures** presented in this report are weighted by R&D investment.

⁴² See: <https://ec.europa.eu/eusurvey/>

⁴³ The response rate of the present survey is 16.2%. This is slightly lower compared to the 18.5% of last year due to a two-week shorter response period. The responsiveness per day has been very steady over the past five surveys.

⁴⁴ For the systematic detection of outliers, an adjusted methodology from the NIST/SEMATECH e-Handbook of Statistical Methods was applied, see: <http://www.itl.nist.gov/div898/handbook/prc/section1/prc16.htm>

R&D Investment Definition

The objective of the survey is to address R&D investment, and not R&D expenditure, due to its direct link to the Innovation Union headline target of 3% R&D-intensity for overall R&D investment of a country as a share of GDP. To make the survey as easy to complete as possible and to maximise the response rate, only a short definition of R&D investment is provided in the survey.⁴⁵ The definition refers mainly to R&D as reported in the company's most recent accounts. The definition used in the survey is thus closely related to the International Accounting Standard (IAS) 38 "Intangible Assets",⁴⁶ based on the OECD "Frascati" manual,⁴⁷ and the definition used in the EU Industrial R&D Investment Scoreboards.

Composition of the Responses

The 162 responses were classified according to the ICB⁴⁸ described in the questionnaire. Sector classifications of individual companies were cross-checked with the Scoreboards. The sectors were grouped according to their average R&D intensities in the Scoreboard as follows:

- **High (more than 5%) R&D-intensity (52 companies):** Pharmaceuticals & Biotechnology, Software & Computer Services, Aerospace & Defence, Technology Hardware & Equipment, Health Care Equipment & Services and Leisure Goods.
- **Medium (between 2 and 5%) R&D-intensity (73 companies):** Industrial Engineering, Automobiles & Parts, Electronic & Electrical Equipment, Chemicals, General Industrials, Fixed Line Telecommunications, Food Producers, Household Goods & Home Construction, Support Services, Alternative Energy, Beverages, Financial Services, Oil Equipment, Services & Distribution, Personal Goods, Tobacco and Travel & Leisure.
- **Low (less than 1%) R&D-intensity (37 companies):** Industrial Metals & Mining, Electricity, Construction & Materials, Banks, Oil & Gas Producers, Forestry & Paper, Gas, Water & Multi-utilities and Industrial Transportation.

Table 3 shows the distribution of the responses among the sectors with their respective R&D investment shares.

⁴⁵ See Annex B

⁴⁶ See <http://www.iasplus.com/standard/ias38.htm>

⁴⁷ See "Proposed Standard Practice for Surveys on Research and Experimental Development: Frascati Manual", OECD, Paris, 2002, <http://www1.oecd.org/publications/e-book/9202081E.PDF>

⁴⁸ ICB Industry Classification Benchmark (see: http://www.icbenchmark.com/docs/ICB_StructureSheet_120104.pdf)

Table 3: Distribution of the responses by sectors

ICB Sector	Number of responses	Number of Scoreboard companies	Response rate by sector	Total R&D investment share compared to the Scoreboard*	R&D intensity sector group**
Pharmaceuticals & Biotechnology	17	105	16.2%	below 20 %	High
Software & Computer Services	13	110	11.8%	below 20 %	High
Aerospace & Defence	8	26	30.8%	between 20 and 40 %	High
Technology Hardware & Equipment	8	49	16.3%	above 40 %	High
Health Care Equipment & Services	5	36	13.9%	between 20 and 40 %	High
Other high R&D-intensity sectors	1	7	14.3%		High
Subtotal high R&D intensity	52	333	15.6%	22.7%	
Industrial Engineering	14	110	12.7%	between 20 and 40 %	Medium
Automobiles & Parts	10	45	22.2%	above 40 %	Medium
Electronic & Electrical Equipment	11	76	14.5%	above 40 %	Medium
Chemicals	9	42	21.4%	above 40 %	Medium
General Industrials	7	41	17.1%	between 20 and 40 %	Medium
Fixed Line Telecommunications	5	11	45.5%	above 40 %	Medium
Food Producers	5	28	17.9%	below 40 %	Medium
Other medium R&D intensity sectors	12	147	8.2%		Medium
Subtotal medium R&D intensity	73	500	14.6%	48.8%	
Industrial Metals & Mining	11	18	61.1%	above 40 %	Low
Electricity	7	17	41.2%	below 40 %	Low
Construction & Materials	6	38	15.8%	between 20 and 40 %	Low
Other low R&D intensity sectors	13	94	13.8%		Low
Subtotal low R&D intensity	37	167	22.2%	24.2%	
Total	162	1000	16.2%	36.3%	

Note: * For confidentiality reasons, R&D investment shares of individual sectors are shown in ranges and only shown for sectors with at least four responses.

** Sector group according to the average Scoreboard R&D-intensity of each sector.

Most of the responses, both in terms of numbers of participants and share of R&D investment in the sample, were from the medium R&D-intensity sectors (see also Figure 5 of the section 2 R&D Investment Expectations).

The number of responses by home country is shown in Table 4 below. According to the Scoreboard methodology, the home country is the country of registered office of the company. Similar to our previous surveys, most participants were from companies located in the three biggest Member States.

Figure 29 reveals that the average survey respondent is a very large company.⁴⁹ However, there are differences in company size between the sector groups.

In terms of average net sales and number of employees, the high the R&D-intensity companies are much smaller than those in the medium and low R&D intensity sectors. The average number of R&D employees of the companies surveyed is around six to seven times bigger in high and medium than in the low R&D-intensity sector. This is the result of the high share of R&D employees in large companies that responded from technology, hardware & equipment, and aerospace & defence (high R&D intensity), automobiles & parts, electronic & electrical equipment and chemicals (medium R&D intensity) sectors.

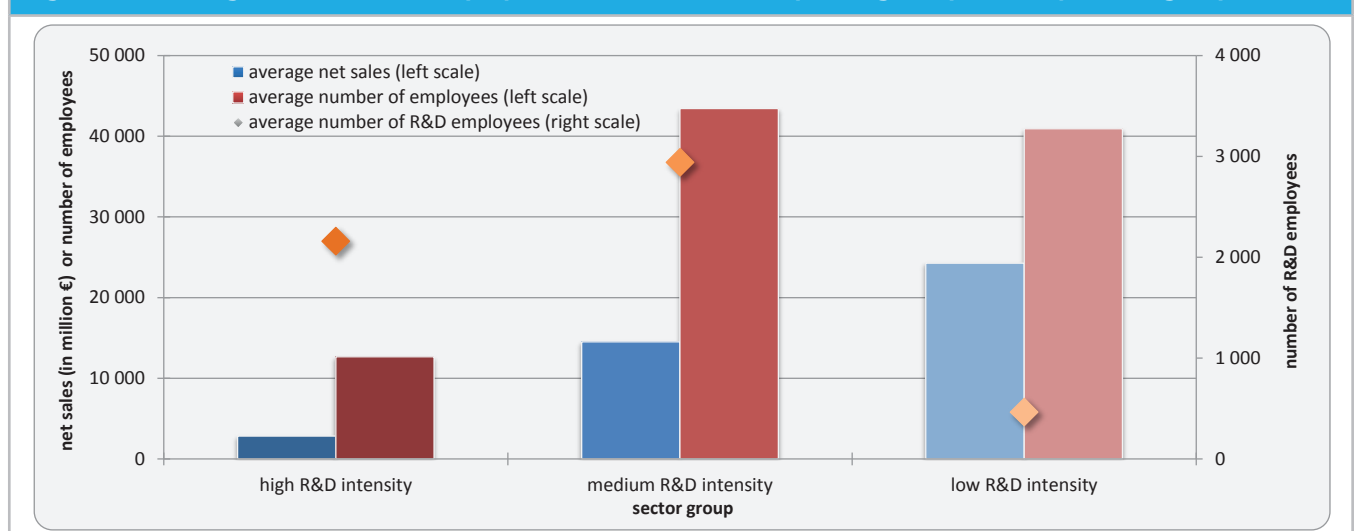
⁴⁹ The average turnover of the responding companies was €13 billion, 33 000 employees, and 2 125 employees in R&D. Among the 162 respondents there were 3 medium-sized and one small company mainly in the high R&D intensity sectors (according to the European Commission's SME definition, see: http://ec.europa.eu/enterprise/enterprise_policy/sme_definition/index_en.htm). Among the large companies in the sample, 14 had between 251 and 1 000 employees, 71 between 1 001 and 10 000 employees, 37 between 10 001 and 30 000 employees, and 37 more than 30 000 employees.

Table 4: Distribution of the responses by home country of the company

country	number of responses	share of responses
Germany	33	58.8%
France	20	11.6%
Italy	16	1.8%
Spain	12	7.3%
United Kingdom	12	4.7%
Finland	11	0.5%
Austria	9	0.8%
Denmark	9	1.1%
Belgium	8	1.2%
Sweden	8	10.3%
The Netherlands	8	0.8%
Portugal	5	0.3%
other European countries	11	0.9%
total	162	100%

Note: For confidentiality reasons, only information for countries with at least four responses is shown.

Source: European Commission JRC-IPTS (2015)

Figure 29: Average turnover and employee numbers for the responding companies, by sector group

Note: The figure refers to 151 out of the 162 companies in the sample.

Source: European Commission JRC-IPTS (2015)

8 Annex B: Questionnaire

QUESTIONNAIRE ON BUSINESS R&D INVESTMENT

We would appreciate your response by **(deadline)**, preferably by using the online form at:

<https://ec.europa.eu/eusurvey/runner/Business-RandD-Investment2015>

Alternatively, you may return this completed form by e-mail (Alexander.Tuebke@ec.europa.eu), fax (+34.95.448.83.26), or post⁵⁰.

The information in your response will be treated as **confidential**. It will only be used within this study and in an aggregated form. The European Commission is committed to the protection and privacy of data⁵¹.

It will take about **35 minutes** to complete the questionnaire.

We will automatically inform you of the results of the survey when they are available (for that, please ensure that you have provided your e-mail address below).

Name of the company you are responding for: _____

Its primary sectors of activity: _____

Your name: _____

Job title: _____

E-mail: _____

Phone number: _____

The European Commission may follow up this survey by short-interviews to clarify major trends revealed in the analysis. Please **tick here** ☐ if you *do not* wish to be approached for this purpose.

Definition of R&D investment

For the purposes of this questionnaire, **'R&D investment' is the total amount of R&D financed by your company** (as typically reported in its accounts). It does not include R&D financed from public sources.

⁵⁰ European Commission, Institute for Prospective Technological Studies (IPTS), Attn: Alexander Tübke, Edificio Expo, Calle Inca Garcilaso 3, E-41092 Seville, Spain, Tel.: +34.95.448.83.80

⁵¹ See the Privacy Statement on the last page

A. Corporate background

1. How many employees in total have worked in your company in the past year (2014)?

Around _____ (FTE⁵²).

2. How many employees have worked on R&D in the company in the past year (2014)?

About _____ (FTE³).

B. R&D investment levels and trends

3. What was your R&D investment in the past year (2014)?

About € _____ million.

4. At what average rate do you expect the company to change its overall R&D investment over the next three years (2015, 2016, 2017), in real terms?

About _____ % per annum.

52. Please indicate the number of employees on either permanent or fixed-term contracts in Full-Time Equivalents (FTE), with part-time employees included on a pro-rated basis in line with their contractual working hours.

C. Key Enabling Technologies

The Commission is undertaking initiatives to strengthen certain Key Enabling Technologies (KETs) for the development of new goods and services.⁵³ *In the table below, please estimate the approximate numbers of patents filed, revenue from licences issued, expenses for licences used and amount of R&D for each technological field in the past year (2014).*

	number of patents filed	revenue from licences issued (million €)	expenses for licences used (million €)	amount of R&D investment (million €)
Key software technologies , e.g. high performance computing, building data value, social computing, internet-based applications, embedded systems, human-centred computing, enterprise applications and the generation of software-intensive systems				
Micro- and nanoelectronics , e.g. semiconductor components and highly miniaturised electronics				
Advanced materials leading to lower-cost substitutes of existing materials and new higher value-added products & services				
Industrial (white) biotechnology applied to industrial processing and production of chemicals, materials and fuels				
Other (red and green) biotechnology applied to medical and agricultural processes				
Nanotechnology , i.e. design, production and application of structures, devices and systems by controlling shape & size at nanometric scale				
Photonics , i.e. conversion of sunlight into electricity, photodiodes, LEDs and lasers				
Advanced manufacturing technologies encompass the use of innovative technology to improve products or processes that drive innovation, including all production equipment that deploys a KET or any other innovative technology				
Environmental technologies (incl. alternative energy), i.e. devices, materials, and techniques for pollution prevention, reduction or containment				
Other technologies especially relevant for your company (please specify):				

⁵³ These Key Enabling Technologies (KETs) enable the development of new goods and services and the restructuring of industrial processes needed to modernise EU industry and make the transition to a knowledge-based and resource-efficient economy. Whilst the EU has very good R&D capacities in some KETs, it has not been as successful at translating research results into commercialised manufactured goods and services. The Commission's KETs strategy aims to boost the industrial production of innovative of KETs-based products and applications of the future, see: http://ec.europa.eu/enterprise/sectors/ict/key_technologies/

D. R&D location strategy

6. Please estimate the distribution of your company's in-house R&D activity among the following world areas in the past year (2014) and three years later (2017)?

Distribution in 2014	R&D carried out:	Expected distribution in 2017
%	in the European Union ⁵⁴	%
%	in other European countries ⁵⁵	%
%	in the US and Canada	%
%	in Japan	%
%	in China	%
%	in India	%
%	in the Rest of the World	%

7. Which countries do you currently consider the most attractive location for *your company's R&D*? Please state the countries regardless whether your company has R&D activity there and rank by attractiveness.

1. _____ 2. _____ 3. _____

⁵⁴ There are currently 28 EU Member States: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, The Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and The United Kingdom.

⁵⁵ Examples of other (non-EU) European countries are: Switzerland, Norway, Iceland, Albania, Moldova, Turkey, Russia, Belarus and the Ukraine (for further examples see the recognised states in: http://en.wikipedia.org/wiki/List_of_sovereign_states_and_dependent_territories_in_Europe#Recognised_states).

8. Please state the two countries where your company currently has the *highest volume of R&D activities*:

A. _____ B. _____

How attractive are these two countries in terms of the following factors? *Please rate on a scale from 1 (very low attractiveness) to 5 (very high attractiveness) and leave not-applicable factors blank.*

	attractiveness of:									
	country A					country B				
	very low				very high	very low				very high
	1	2	3	4	5	1	2	3	4	5
(a) Demand for innovative goods & services:										
(a1) market size	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(a2) market growth	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(a3) through public procurement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(a4) via product market regulation, norms & standards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(b) Human resources:										
(b1) quality of R&D personnel in the labour market	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(b2) quantity of R&D personnel in the labour market	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(b3) labour costs of R&D personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(c) Proximity to:										
(c1) technology poles ⁵⁶ and incubators ⁵⁷	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(c2) other company sites, e.g. production or sales	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(c3) suppliers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(d) Collaboration & knowledge-sharing opportunities:										
(d1) with other firms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(d2) with universities and public research organisations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(e) Public financial support for R&D via:										
(e1) fiscal incentives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(e2) grants and direct funding	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(e3) loans and guarantees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(e4) public-private partnerships	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(e5) financing other (non-R&D) investments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(f) Intellectual Property Rights in terms of:										
(f1) costs of protection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(f2) time to obtain protection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(f3) conditions for putting them into force	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Other (please specify):

⇒ _____

⁵⁶ "Technology poles" are areas where R&D active companies, institutions and universities are concentrated.

⁵⁷ "Incubators" are structures that support innovative startup companies in order to increase their survival rates.

E. Structural reforms supporting R&D and innovation

9. In response to the economic crisis the Commission has undertaken important reforms of the EU's economic governance rules⁵⁸ pushing for structural reforms. In this context, what potential do the following initiatives have for *increasing* your company's R&D and innovation⁵⁹ activities? *Please rate on a scale from 1 (no potential) to 5 (very high potential).*

	No potential				Very high potential
	1	2	3	4	5
(a) Single market reforms allowing free flow across national borders of:					
(a1) goods	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(a2) services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(a3) online services and entertainment (digital single market ⁶⁰)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(a4) energy, eliminating energy islands and integrating renewables	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(b) Making it lighter, simpler and less costly to comply with:					
(b1) EU laws	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(b2) national laws	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(c) Removing obstacles to job creation via:					
(c1) modernising levels of protection for those in work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(c2) reforming labour dispute resolution schemes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(c3) increasing labour tax deductions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(c4) reducing labour market segmentation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(c5) upgrading vocational training and education systems to provide the necessary skill sets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(d) Pension system reforms via:					
(d1) reducing employer contributions to obligatory employee pension schemes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(d2) closer linking retirement ages to life expectancy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(e) Improving framework conditions for:					
(e1) business investment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(e2) public private partnerships	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(f) Ensuring an efficient and growth-friendly tax system via:					
(f1) shifting the tax burden from labour tax to others, e.g. property, environment or consumption tax	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(f2) prioritising productive and growth-friendly public investment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(f3) reducing the complexity of the tax system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(g) Other (please specify):					
⇒					

58 See: "The 2015 Annual Growth Survey": http://ec.europa.eu/europe2020/pdf/2015/ags2015_en.pdf

59 Innovation is the introduction of new or significantly improved products, services, or processes.

60 The Digital Single Market is the update of EU Single Market rules for the digital era leading to a free flow of online services and entertainment across national borders. The aims are to boost the music download business, establish a single area for online payments, and further protect EU consumers in cyberspace, borders. See: <http://ec.europa.eu/digital-agenda/our-goals/pillar-i-digital-single-market>

F. Final comments or suggestions

⇒ _____

Thank you very much for your contribution!

Privacy Statement

The 2015 EU Survey on R&D Investment Business Trends is carried out by the Industrial Research and Innovation (IRI) action of the European Commission's Joint Research Centre (JRC), Institute for Prospective Technological Studies (IPTS). The survey is directed at the 1000 European companies in the 2013 EU Industrial R&D Investment Scoreboard.

The European Union is committed to data protection and privacy as defined in Regulation (EC) n° 45/2001. This survey is under the responsibility of the IRI action leader, Fernando Hervás Soriano, acting as the Controller as defined in the above regulation. The Controller commits himself dealing with the data collected with the necessary confidentiality and security as defined in the regulation on data protection and processes it only for the explicit and legitimate purposes declared and will not further process it in a way incompatible with these purposes. These processing operations are subject to a Notification to the Data Protection Officer (DPO) in accordance with Regulation (EC) 45/2001.

Purpose and data treatment

The purpose of data collection is to establish the analysis of the *2015 EU Survey of R&D Investment Business Trends*. This survey has a direct mandate from the Commission's 2003 Action Plan "Investing in Research" (COM 2003 (226) final, see http://ec.europa.eu/invest-in-research/action/2003_actionplan_en.htm). The personal data collected and further processed are:

- Company: name, primary sectors of activity, company size
- Contact Person: name, job title, phone number, e-mail

The collected personal data and all information related to the above mentioned survey is stored on servers of the JRC-IPTS, the operations of which underlie the Commission's security decisions and provisions established by the Directorate of Security for these kind of servers and services. **The information you provide will be treated as confidential and aggregated for the analysis.**

Data verification and modification

In case you want to verify the personal data or to have it modified respectively corrected, or deleted, please write an e-mail message to the address mentioned under "Contact information", by specifying your request. Special attention is drawn to the consequences of a delete request, in which case any trace to be able to contact you will be lost. Your personal data is stored as long as follow-up actions to the above mentioned survey are necessary with regard to the processing of personal data.

Contact information

In case you have questions related to this survey, or concerning any information processed in this context, or on your rights, feel free to contact the IRI Team, operating under the responsibility of the Controller at the following email address: jrc-ipts-iri@ec.europa.eu.

Recourse

Complaints, in case of conflict, can be addressed to the European Data Protection Supervisor (EDPS) at www.edps.europa.eu.

European Commission
EUR 27541 EN - Joint Research Centre - Institute for Prospective Technological Studies

Title: The 2015 EU Survey on Industrial R&D Investment Trends

Authors: Alexander Tübke, Fernando Hervás, Nicola Grassano and Petros Gkotsis

Luxembourg: Publications Office of the European Union, 2015

2015 - 50 pp. - 21.0 x 29.7 cm

EUR – Scientific and Technical Research series – ISSN 1831-9424 (online), ISSN 1018-5593 (print)

ISBN 978-92-79-53027-2 (pdf), ISBN 978-92-79-53026-5 (print)

doi:10.2791/536246 (online), doi:10.2791/692137 (print)

Abstract

This tenth survey on industrial R&D investment trends is based on 162 responses of mainly large firms from a subsample of the 1000 EU-based companies in the 2014 EU Industrial R&D Investment Scoreboard. These 162 companies are responsible for €60 billion R&D investment, constituting around 36% of the total R&D investment by the 1000 EU Scoreboard companies.

The responding companies expect to increase their nominal R&D investment by 3.0% per year during 2015–17. This is a third less than the expected increases of last year's survey (4.2%) and slightly higher than the results of the one the year before (2.6%).

The responding companies carry out one-fourth of their R&D outside the EU. The responding companies' expectations for R&D investment for the next three years show the ongoing participation of European companies in the global economy. While maintaining the focus of their R&D investment in the EU, they reap opportunities for growth in emerging economies. Three out of four of the responding EU-based companies consider their home country among the three most attractive locations for R&D. Regarding non-EU countries, the United States, China and India are seen as the most attractive locations outside the home country.

JRC Mission

As the Commission's in-house science service, the Joint Research Centre's mission is to provide EU policies with independent, evidence-based scientific and technical support throughout the whole policy cycle.

Working in close cooperation with policy Directorates-General, the JRC addresses key societal challenges while stimulating innovation through developing new methods, tools sharing standards, and sharing its know-how with the Member States, the scientific community and international partners.

*Serving society
Stimulating innovation
Supporting legislation*

